

Richards, Dale E

De: Wells, Nadine
Envoyé: January-17-14 3:30 PM
À: Clarke, Keith
Cc: Richards, Dale E
Objet: RE: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 -
Deadline for comments January 20, 2014

Hi Keith,

The work done to identify and describe additional EBSAs in the NL Shelves area has not been incorporated into this report. The attached SAR contains the information I am referring to, and the data layers for the EBSAs described within can be provided upon request. The Orphan Spur EBSA, as well as possibly the edge of the Notre Dame Channel EBSA, overlaps with the study area. Cheers,

Nadine



DFO_ID_of_addit...

From: Clarke, Keith
Sent: 2013–December-24 8:27 AM
To: Anderson, M. Robin; Gilkinson, Kent; Gregory, Robert; Koen-Alonso, Mariano; Loughlin, Kristin G; McKenzie, Cynthia; Morris, Corey; Ollerhead, Neil; Payne, Jerry F; Wareham, Vonda; Wells, Nadine
Subject: FW: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comments January 20, 2014

FYI

From: Richards, Dale E
Sent: 2013–December-23 4:56 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason
Subject: RE: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comments January 20, 2014

Good afternoon,

In consultation with the RDS-Office, the CSA Unit has decided that based on the timing of this request and the draft nature of the Eastern Newfoundland SEA report that this request for advice will be provided to Ecosystems Management via a memo. i.e. there will be no formal Science meeting or SSRP process at this time. To that end, comments on the SEA report will be needed by the CSA office by **Monday, January 20th**. This will allow the CSA Unit a few days to compile the comments.

Section heads, please ensure that this request and deadline is sent to the appropriate scientist within your section. For your reference, the original e-mail is provided below.

If you have any questions, please let me know.

Thank you,
Dale

From: Richards, Dale E
Sent: December 2, 2013 2:19 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry
Subject: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comment mid-January 2014 - Please action

Good afternoon,

CSA has received, from the FPP (via the C-NLOPB) for review, the Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1.

DFO is providing expert advice, to support the C-NLOPB, on baseline conditions (i.e. environmental setting) and mitigations related to potential impacts of oil and gas activities on fish, fish resources, SAR, sensitive areas and DFO research activities.

To provide context related to the SEA process please see Section 2: SEA - Scope and Approach.

The Science review should focus on whether the baseline information is accurate and that the effects assessment, taking into consideration departmental guidance such as the "Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment"

Listed below are specific Sections of the EA Report which require Science review and comments:

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- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Protected and Other Designated Sensitive Areas
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Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
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The FPP has requested that Science provide comments by the end of January. In the interim, until a Branch decision has been made on how this request for advice is going to be handled (i.e. memo or SSRP process), I have placed the SEA report on the shared drive in the '**CSA Review**' folder, subfolder '**Eastern Newfoundland SEA - December 2013 Request**'. This will allow the maximum time available to Science to review and provide comment on the report. Whether a SSRP process takes place or a memo is formulated, I suspect that comments will be required from individual scientists by **mid-January 2014**. I will be in touch at a later date regarding specific deadlines and what format this request for advice will take.

As always, if you have any questions please let me know. Section heads, please ensure that this request is sent to the appropriate scientist within your section.

Thank you,
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E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

Newfoundland and Labrador Region / La Région de Terre-Neuve et du Labrador

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Science

Sciences

Canadian Science Advisory Secretariat
Science Advisory Report 2013/048

Newfoundland and Labrador Region

IDENTIFICATION OF ADDITIONAL ECOLOGICALLY AND BIOLOGICALLY SIGNIFICANT AREAS (EBSAS) WITHIN THE NEWFOUNDLAND AND LABRADOR SHELVES BIOREGION



Figure 1: Study area for the identification of EBSAs in the Newfoundland and Labrador Shelves Bioregion.

Context:

In support of domestic integrated management efforts, EBSAs have been identified in each of DFO's five Large Ocean Management Areas (LOMAs), including the Placentia Bay Grand Banks LOMA (Templeman 2007). Advice on the identification of additional EBSAs (see DFO 2009) that are within the larger Newfoundland and Labrador Shelves Bioregion exclusive of the Placentia Bay/Grand Banks LOMA will serve as a key component of the information necessary for i) developing Canada's network of marine protected areas (MPAs) to meet the domestic and international commitments, and ii) facilitating the implementation of DFO's Sustainable Fisheries Framework under the Fisheries Act. In addition, this information will be of direct use to other federal Departments, as well as the Government of Newfoundland and Labrador and other organizations, which are responsible for the management of activities in the Newfoundland and Labrador Shelves Bioregion within their mandate.

This Science Advisory Report is from the October 23-25, 2012 review on the Identification of Ecologically and Biologically Significant Areas (EBSAs) for the Newfoundland and Labrador Shelf Bioregion. Additional publications from this meeting will be posted on the [Fisheries and Oceans Canada \(DFO\) Science Advisory Schedule](#) as they become available.

**Pages 5 to / à 29
are withheld pursuant to section
sont retenues en vertu de l'article**

68(a)

**of the Access to Information Act
de la Loi sur l'accès à l'information**

Richards, Dale E

De: Mowbray, Fran
Envoyé: February-13-14 2:42 PM **s.19(1)**
À: Richards, Dale E
Objet: FW: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 -
Deadline for comments January 20, 2014

From: Nakashima, Brian
Sent: January-13-14 11:13 AM
To: Mowbray, Fran
Cc: Bourne, Christina M
Subject: RE: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comments
January 20, 2014

Here are my comments on the capelin parts of the SEA Draft. Generally an improvement in what is being produced about capelin. A few suggestions for clarification and most important for capelin, the SEA should be aware of/acknowledge the risk that an oil/substance spill that affects the Southeast Shoal could have a significant negative impact on the 3NO capelin stock because all spawning for this stock takes place on the Southeast Shoal. More important from a DFO Science perspective, should something happen we would never know its significance because there are no monitoring surveys of SE Shoal capelin.

Brian



Review of Eastern
Newfoundland...

Brian Nakashima
Research Scientist / Chercheur Scientifique
Fisheries and Oceans Canada / Pêches et Océans Canada
Northwest Atlantic Fisheries Centre /
Centre des pêches de l'Atlantique Nord-Ouest
80 East White Hills Road
St. John's, NL A1C 5X1

Tel/Tél. (709) 772-4925
Fax/Télécopieur (709) 772-4188
Email/Courriel brian.nakashima@dfo-mpo.gc.ca

From: Mowbray, Fran

Sent: January 2, 2014 4:16 PM

To: Nakashima, Brian; Bourne, Christina M

Subject: FW: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comments
January 20, 2014

Now we have a deadline....

From: Richards, Dale E

Sent: December-23-13 4:56 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

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Dale

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- Section 5.4 – Sensitive Areas

The FPP has requested that Science provide comments by the end of January. In the interim, until a Branch decision has been made on how this request for advice is going to be handled (i.e. memo or SSRP process), I have placed the SEA report on the shared drive in the '**CSA Review**' folder, subfolder ' **Eastern Newfoundland SEA - December 2013 Request**'. This will allow the maximum time available to Science to review and provide comment on the report. Whether a SSRP process takes place or a memo is formulated, I suspect that comments will be required from individual scientists by **mid-January 2014**. I will be in touch at a later date regarding specific deadlines and what format this request for advice will take.

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Thank you,
Dale

E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

Newfoundland and Labrador Region / La Région de Terre-Neuve et du Labrador

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<http://www.dfo-mpo.gc.ca/csas-sccs/>

Comments on Eastern Newfoundland SEA draft #1 – capelin

p. 196 -capelin also spawn on the bottom in coastal waters.

-capelin found in 3NLOPs in spring RV survey. Include 3K and 2J from fall RV survey. Besides the RV trawl surveys, capelin distribution information is available from annual DFO acoustic surveys.

p. 198 -Table 4.54 spawning on Southeast Shoal takes place in June, July.

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feeding areas and likely aggregate with capelin that will be maturing and spawning next year. The timing, the route, and the mechanisms used to migrate from coastal waters to offshore feeding areas has not been documented as far as I am aware.

p. 395 -accidental spills of oils or other substances onto the Southeast Shoal during the period capelin are spawning, eggs are incubating, and yolk sac larvae are in the sediment could have a negative impact on that yearclass and subsequent spawning biomass and this risk should be recognized.

p. 401 -indicates Southeast Shoal is the nursery for yellowtail flounder. It should be acknowledged that the Southeast Shoal is also the spawning site for the Southeast Shoal capelin stock.

Richards, Dale E

De: Mowbray, Fran
Envoyé: March-10-14 10:27 PM
À: Richards, Dale E
Cc: Nakashima, Brian
Objet: FW: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft -
Deadline for comments April 2, 2014
Pièces jointes: Review of Eastern Newfoundland SEA Draft Report (Feb 2014)-capelin.docx

Dale - Please see revised copy of Brian's comments. Thanks Brian.

Fran

From: Nakashima, Brian
Sent: Mon 10/03/2014 11:08 AM
To: Mowbray, Fran
Cc: Bourne, Christina M
Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments
April 2, 2014

Fran,

I have compared the capelin sections in this update to the previous one and the capelin sections have not changed. Attached are my original comments with two minor changes in the text. The reference pages have been changed to reflect the appropriate locations in the Feb 2014 Draft Report.

<<Review of Eastern Newfoundland SEA Draft Report (Feb 2014)-capelin.docx>>

Brian

Brian Nakashima

Research Scientist / Chercheur Scientifique

Fisheries and Oceans Canada / Pêches et Océans Canada

Northwest Atlantic Fisheries Centre /

Centre des pêches de l'Atlantique Nord-Ouest

80 East White Hills Road

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Tel/Tél (709) 772-4925

Fax/Télécopieur (709) 772-4188

Email/Courriel: brian.nakashima@dfo-mpo.gc.ca

From: Richards, Dale E

Sent: March 7, 2014 3:40 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason; Sooley, Darrin; Wells, Nadine; Nakashima, Brian; Hamoutene, Dounia

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments April 2, 2014

Importance: High

Good afternoon,

Following several delays, the 'Draft' Eastern Newfoundland SEA has finally been posted on the CLNOPB website. It can be accessed at the following link:

<http://www.cnlopb.nl.ca/enlsea.shtml>. The full SEA document along with the associated SEA appendices have also been posted on the shared Science drive under the Science folder: Science Info/CSA Review/ Habitat/ SEA & EA/ Eastern NL SEA March 2014 request. Please note that I have not removed the 'Eastern NL SEA December 2013' files from the shared folder by chance that someone wishes to compare the two draft versions. However, if you have not commenced your review please be sure to use to the most recent version of these SEA files.

To date I have received a few submissions pertaining to this request and this content will be included in the Science response memo. To those Sections that still intend on sending along comments or additional revisions the CSA Office will require such submissions by **April 2nd**.

Listed below are specific Sections of the EA Report which require Science review:

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- Section 4.1.4 – Oceanography
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- Section 4.2.4 - Sensitive and Special Areas (note revised title)
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Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
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- Section 5.4 – Sensitive and Special Areas (note revised title)

Please give me a call if you have any questions on this process.

Thank you,

Dale

From: Richards, Dale E

Sent: January 31, 2014 1:47 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

Good afternoon,

There has been a further delay in the submission of the Eastern Newfoundland SEA for review. The latest I have received from the FPP (via the CLNOPB) is that the 'final' draft report will be made available to us for review the end of February. I will continue to keep you updated as CSA receives any information.

Dale

From: Richards, Dale E

Sent: January 7, 2014 12:59 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

The CLNOPB has advised that the submission of the 'final' draft report - Eastern Newfoundland SEA - to FPP will be delayed until the end of January. This 'final' draft will be an update to the 'preliminary' Draft #1 version highlighted in the e-mail below and posted on the Science shared drive prior to the Christmas break. Based on this information, we know that an extension on this request for advice will be forthcoming. Thus, it may be advisable to delay your review of the preliminary draft of the SEA report until the final draft becomes available.

As soon as the CSA Unit receives an update from FPP, I will send out a revised deadline to this request. At this point, a 3-week delay to obtain the 'final' draft SEA is anticipated.

Please give me a call if you have any questions on this process.

Thank you,

Dale

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Sent: December 23, 2013 4:56 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

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E. Dale Richards, B.Sc. Hons., M.Sc.

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Richards, Dale E

De: Bourne, Christina M
Envoyé: March-14-14 3:32 PM
À: Richards, Dale E
Cc: Mowbray, Fran
Objet: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft -
Deadline for comments April 2, 2014

Sorry, that should have been 450m

From: Bourne, Christina M
Sent: March-14-14 3:31 PM
To: Richards, Dale E
Cc: Mowbray, Fran
Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments
April 2, 2014

Hi Dale,

I only have one comment for herring.

p. 193 – herring occurrence has been recorded up to 350m in multispecies surveys

Christina Bourne
*Aquatic Sciences Biologist
Science Branch, Fisheries and Oceans
Northwest Atlantic Fisheries Centre
St. John's, Newfoundland
(709)772-2005*

From: Richards, Dale E
Sent: March 7, 2014 3:40 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn;
Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine
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- Section 5.4 – Sensitive and Special Areas (note revised title)

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Thank you,
Dale

From: Richards, Dale E

Sent: January 31, 2014 1:47 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

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Sent: January 7, 2014 12:59 PM

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Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

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E. Dale Richards, B.Sc. Hons., M.Sc.

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Fax/ Télécopieur: (709) 772-6100

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<http://www.dfo-mpo.gc.ca/csas-sccs/>

Richards, Dale E

De: Mowbray, Fran
Envoyé: March-14-14 4:08 PM
À: Richards, Dale E
Objet: FW: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft -
Deadline for comments April 2, 2014

Hi Dale – See a few comments in attached document. I am forwarding only comments for sandlance and Brain has covered capelin and Christina covered herring.



Comments on
Eastern Newfou...

Fran

From: Richards, Dale E
Sent: March 7, 2014 3:40 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason; Sooley, Darrin; Wells, Nadine; Nakashima, Brian; Hamoutene, Dounia
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Importance: High

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Comments on Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft with regard to Sandlance.

1. Spawning season is winter (Dec-March) not June –Aug as indicated in table 4.64.
2. Page 200, text says sandlance constitute 6% of RV catch and text says they constitute 30%
3. Page 200 – should insert information re habitat usage burrowing in substrate part of day, migrating vertically to feed. No distance migrations as are closely associated with habitat.
4. Page 200 – Inshore and Offshore sandlance are two different species. This should be noted as should which species is impacted by the proposed work.

Richards, Dale E

De: Gilkinson, Kent
Envoyé: March-28-14 2:33 PM
À: Richards, Dale E
Objet: E. NFLD SEA review

Hi Dale. My specific comments are in a combination of bold and highlighting.



Eastern
Newfoundland ...

Cheers, Kent

Kent Gilkinson, PhD
Environmental Sciences Division
Northwest Atlantic Fisheries Centre
P.O. Box 5667
St. John's, Newfoundland & Labrador, Canada A1C 5X1
Phone: 709-772-4718
Fax: 709-772-5315

Review by K. Gilkinson of Eastern Newfoundland SEA Report

General Comments

I have reviewed sections of the report relevant to my area of expertise- corals/sponges benthos general. Note that Vonda has not reviewed the report [REDACTED]
[REDACTED] As such, she may have picked up on nuances that I may have missed.

Specific

Fig. 1.1 It would be helpful to include major bathymetric contours/features on the map similar to Fig. 2.2. As it stands there is very little frame of reference. Also, perhaps darken contours somewhat.

P. 25 14) CAPP- assume this is correct definition? It is also the acronym for Canadian Association of Prawn Producers

Fig. 4.6. Should indicate in title or legend that bathymetry is in 'm'.

4.2.1.5 "Studies to date indicate that, like fish, benthic assemblages respond to environmental variables such as depth, substrate and flow field (Houston and Haedrich 1984; Schneider et al 1987)."

Add the following references related to Grand Banks benthos: Gilkinson and Gagnon, 1991; Gilkinson, 2013; Gale et al. (in press)

Gilkinson, K.D and J-M Gagnon. 1991. Substratum associations of natural populations of Iceland scallops, *Chlamys islandica* Müller 1776, on the northeastern Grand Bank of Newfoundland. American Malacological Bulletin 9, 59-67.

Gilkinson, K. 2013. Recent DFO (Newfoundland & Labrador Region) studies of the Grand Banks benthos at small and large spatial scales. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/114. V + 30 p.

Gale, K.S.P., K. Gilkinson, J-F Hamel and A. Mercier. (in press). Patterns and drivers of asteroid abundances and assemblages on the continental margin of Atlantic Canada. Marine Ecology.

p. 168. "... and DFO and **NAFO** RV surveys...

"...visual assessments also poorly... ". **What is meant by 'visual assessments?**

"It is also important to note that characterizations of benthic communities are also inevitably biased according to sampling method. For example, visual assessments often poorly assess infaunal communities whereas grabs may have challenges sampling communities over harder substrates." **It should also be noted that bottom trawls typically sample only a small fraction of resident benthos, most often larger epibenthos.**

p. 187 "A number of research initiatives have also characterized benthic communities on the Grand Banks (Schneider et al 1987; Kenchington et al 2001)" **Add: Gilkinson, 2013; Gale et al. (in press). Gilkinson (2013) documents benthic communities over areas of Grand Bank as part of the DFO NL NEREUS Ecosystem Research Initiative, which involved a 3-year grab sampling program during multispecies trawl surveys. Gale et al. (in press) describe seastar (Asteroidea) assemblages and habitat use over wide areas of the eastern Canadian continental shelf and slope based on DFO survey trawl bycatch records and ROV video.**

"Perhaps the most holistic sampling was done on the Grand Banks as part of a series of trawling impact studies (Prena et al 1999; Kenchington et al 2001). These researchers used video and grabs (Kenchington et al 2001) and a benthic sled and **trawl bycatch** (Prena et al 1999)..."

Table 4.58 Overview of Some Key Shellfish Species in the SEA Study Area
Note: some non-shellfish spp. are included in this table. E.g. sea urchins, polychaetes, sponges etc.

Table 4.58. **Should be **Iceland** scallop not Icelandic.**

"Spat settle primarily between August and November at depths of 10-15 m. **NOTE: They also settle in deep offshore water, primarily gravel, on Grand Bank (see Gilkinson and Gagnon, 1991)**

Under section on 'Pale Sea urchin' and depth distribution add Gagnon and Gilkinson (1994) reference.

Gagnon, J-M., K.D. Gilkinson. 1994. Discrimination and distribution of the sea urchins *Strongylocentrotus droebachiensis* (O.F. Müller) and *S. pallidus* (G.O. Sars) in the Northwest Atlantic. *Sarsia* 79, 1-11.

Under section on surf clam. Actually, surfclams (*Spisula solidissima*) are mostly confined to warmer waters, which on Grand Bank, is the Tail of the Bank and SE Shoal. The species that is harvested commercially north-east of here is the Arctic surfclam, *Mactromeris polynyma* with only sporadic occurrences of S.s. Contact Elaine Hynick at DFO for more detailed info.

Polychaete worms. It is stated that they occur on a variety of substrates. Much of Grand Bank is comprised of sandy sediments which support abundant and diverse populations (documented by Kenchington et al., 2001).

“Collectively, these studies confirm that benthic communities in the SEA Study Area are quite diverse compared to higher trophic levels, as well as being somewhat sensitive to anthropogenic effects...” **This statement needs qualification. When speaking in terms of sand-dominated continental shelves, the global literature on fishing impacts in these habitats indicate that, in many cases, recovery can be relatively rapid (e.g. months). However, in deep-water slope environments inhabited by slow growing, long-lived corals and sponges, recovery could be measured in terms of decades in many cases, if not longer (refs.).**

P. 192. “A total of four invertebrate taxa (snow crab, northern shrimp, pink striped shrimp, and shrimp *Pandalus propinquus*) were available from the Canadian RV surveys (Table 4.60). **This needs clarification. These are the major commercial spp., however many other non-commercial taxa have been processed using standardized protocols during RV surveys since 2005/2006. The point of availability is inaccurate.**

Corals and sponges- **Change all Wilkinson and Edinger (2009) citations to Wilkinson and Edinger (eds.)(2009); also in references.**

“Collectively, sea pens, soft corals, stony corals, and sponges are represented across the shelf, slopes and banks of the Study Area but are found at their highest densities along the slopes, i.e. depths > 200 m (Wilkinson and Edinger, eds., 2009; Wareham and Edinger, 2007; Wareham, 2010; DFO 2010; NAFO 2010; Murillo et al 2011)

Wareham, V.E. and E.N. Edinger. 2007. Distribution of deep-sea corals in the Newfoundland and Labrador region, Northwest Atlantic Ocean. Bulletin of Marine Sciences 81 (Suppl. 1): 289-312.

Wareham, V.E. 2010. Identification, distribution, and conservation of deep-sea corals in Canada’s Northwest Atlantic. M.Sc. thesis. Memorial University of Newfoundland. 201 pp.

“Sponges, in contrast are more widely distributed and high densities can be found along the eastern slopes of the Grand Banks, around the Flemish Cap and along the northern slopes of the SEA Area.” **Provide reference**

“In response to the known sensitivity of coral and sponge grounds, many a number of important coral and sponge areas have been designated as Vulnerable Marine Ecosystems (VMEs) (DFO 2012b) and are protected from damaging fishing activities in Canadian and NAFO waters..” **It should be noted that with the exception of a**

portion of the SW Grand Banks slope closure, these fishing closures occur in the NAFO regulatory area outside Canadian waters.

4.2.1.10 Ecologically and Biologically Significant Areas (EBSAs). "*Southeast Shoal and Tail of the Banks*: This EBSA falls within the SEA Study Area, and has been identified due to its importance to the finfish, invertebrate, and plankton community. The Southeast Shoal has been designated primarily because of its importance as a spawning area for several commercial (American plaice, yellowtail flounder, capelin and Atlantic cod) and non-commercial (northern sand lance) fish species." **Note: The SE Shoal is an area with some of the highest (if not the highest) benthic biomasses recorded anywhere in the world due to the standing biomass of populations of the Arctic wedge clam, *Mesodesma*.**

Figs. 4.70, 4.71. **What is the time period covered by the coral and sponge RV records? This should be stated in the figure titles.**

Figure 4.89 Ecologically & Biologically Significant Areas (EBSAs). **Why are EBSAs outside the Eastern Nfld. SEA boundaries included?**

Figure 4.90 Ecologically Important Areas Identified in the Orphan Basin SEA (2003). **The colour designation for the Orphan Basin area should be a darker shade to differentiate from the surrounding area.**

Figure 4.91 Areas of Relatively High Faunal Abundance as Identified by Canadian RV Surveys, 2005-2009 (Finfish and Invertebrates) **The legend provides a colour scheme for abundances. How were these derived? Similarly for Fig. 4.92 (biomass), and Fig. 4.93 (spp. richness)**

Kent Wilkinson

March 28/14

Richards, Dale E

De: Simpson, Mark R
Envoyé: April-02-14 1:43 PM
À: Richards, Dale E
Objet: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments April 2, 2014



SEA_review_MFS...

See attached

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From: Richards, Dale E
Sent: January 7, 2014 12:59 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason
Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

The CLNOPB has advised that the submission of the 'final' draft report - Eastern Newfoundland SEA - to FPP will be delayed until the end of January. This 'final' draft will be an update to the 'preliminary' Draft #1 version highlighted in the e-mail below and posted on the Science shared drive prior to the Christmas break. Based on this information, we know that an extension on this request for advice will be forthcoming. Thus, it may be advisable to delay your review of the preliminary draft of the SEA report until the final draft becomes available.

As soon as the CSA Unit receives an update from FPP, I will send out a revised deadline to this request. At this point, a 3-week delay to obtain the 'final' draft SEA is anticipated.

Please give me a call if you have any questions on this process.

Thank you,
Dale

From: Richards, Dale E
Sent: December 23, 2013 4:56 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comments
January 20, 2014

Good afternoon,

In consultation with the RDS-Office, the CSA Unit has decided that based on the timing of this request and the draft nature of the Eastern Newfoundland SEA report that this request for advice will be provided to Ecosystems Management via a memo. i.e. there will be no formal Science meeting or SSRP process at this time. To that end, comments on the SEA report will be needed by the CSA office by **Monday, January 20th**. This will allow the CSA Unit a few days to compile the comments.

Section heads, please ensure that this request and deadline is sent to the appropriate scientist within your section. For your reference, the original e-mail is provided below.

If you have any questions, please let me know.

Thank you,
Dale

From: Richards, Dale E

Sent: December 2, 2013 2:19 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry

Subject: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comment mid-January 2014 - Please action

Good afternoon,

CSA has received, from the FPP (via the C-NLOPB) for review, the Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1.

DFO is providing expert advice, to support the C-NLOPB, on baseline conditions (i.e. environmental setting) and mitigations related to potential impacts of oil and gas activities on fish, fish resources, SAR, sensitive areas and DFO research activities.

To provide context related to the SEA process please see Section 2: SEA - Scope and Approach.

The Science review should focus on whether the baseline information is accurate and that the effects assessment, taking into consideration departmental guidance such as the "Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment"

Listed below are specific Sections of the EA Report which require Science review and comments:

Environmental Setting

- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Protected and Other Designated Sensitive Areas
-

Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
- Section 5.3 – Marine Mammals and Sea Turtles (including Species at Risk and Other Key Species)
- Section 5.4 – Sensitive Areas

The FPP has requested that Science provide comments by the end of January. In the interim, until a Branch decision has been made on how this request for advice is going to be handled (i.e. memo or SSRP process), I have placed the SEA report on the shared drive in the **'CSA Review' folder, subfolder ' Eastern Newfoundland SEA - December 2013 Request'**. This will allow the maximum time available to Science to review and provide comment on the report. Whether a SSRP process takes place or a memo is formulated, I suspect that comments will be required from individual scientists by **mid-January 2014**. I will be in touch at a later date regarding specific deadlines and what format this request for advice will take.

As always, if you have any questions please let me know. Section heads, please ensure that this request is sent to the appropriate scientist within your section.

Thank you,
Dale

E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

Newfoundland and Labrador Region / La Région de Terre-Neuve et du Labrador

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Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO

<http://www.dfo-mpo.gc.ca/csas-sccs/>

Review of the Report "EASTERN NEWFOUNDLAND STRATEGIC ENVIRONMENTAL ASSESSMENT"

General comments

The report provides a comprehensive review of the biology, ecology, distribution and general aspects of the life history of several relevant fish species inhabiting the Grand Bank and southern Labrador shelf. In general the data shown in the Figures and Tables are accurate and informative, and the references cited in the report are generally up to date, with a few exceptions, notably the lack of the most recent publications describing feeding habits and distribution and abundance trends of the three wolffish species found in the study area. Another interesting aspect of this report is the integrated approach used to describe fish habitat and how it varied temporally and spatially, including the interrelationships of the various trophic/ecological components.

With regards to environmental interactions, mitigation and planning considerations, the report presents a comprehensive description of possible interrelationships resulting from potential offshore oil and gas activities on the Grand Bank and adjacent areas (as summarized in Table 5.1). The report lists the major activities related to seismic surveys, exploration, drilling and production activities, and how these activities might potentially impact fish and fish habitat, while considering results from previous studies and other sources of available information. However, I found that some of 'Environmental Mitigation Measures' as stated in the report are vague. For example, the report suggests as a mitigation procedure 'avoiding species at risk where possible during the planning and conduction of oil and gas activities in the offshore'; the three wolffish species are found throughout the study area, therefore no practical avoidance exists. What should be a practical mitigation measure in the case of wolffish or white sharks? Moreover, there are no considerations regarding accidental oil spills vis-à-vis fish species at risk and their habitat. This study includes the spatial distribution of abundance indices for the three wolffish species; and potential spatial and temporal trajectories of oil spills have been modelled/simulated in previous studies (e.g. Net Environmental Benefit Analysis of Dispersant Use for Responding to Oil Spills from Oil and Gas Facilities on the Newfoundland Grand Banks, 2013); both sources of information could be used to assess the impact of oil spills on the wolffish populations components found in the study area and could also be used as a framework for identifying appropriate mitigation measures in the case of oil spills.

In addition, acronyms for legislation (e.g. SARA) should not be italicized. And "striped wolffish" and "Atlantic Wolffish" are used interchangeably whereas it would be useful to be consistent.

Specific comments

P. 185. Atlantic wolffish. Add references:

Simpson et al. 2013 (Simpson, M.R., Sherwood, G.D., Mello, L.G.S. Miri, C.M., and Kulka, D.W. 2013. Feeding habits and trophic niche differentiation in three species of wolffish (*Anarhichas* sp.) inhabiting Newfoundland and Labrador waters. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/056. v + 29 p.).

Collins et al. 2014 (Collins, R.K., Simpson, M.R., Miri, C.M., Mello, L.G.S., Hedges, K, Chabot, D., Benoît, H., McIntyre, T.M. 2014. Assessment of Northern Wolffish, Spotted Wolffish, and Atlantic Wolffish in the Atlantic and Arctic Oceans. DFO Can. Sci. Advis. Sec. Res. Doc. 2014/034.).

(Add the same references for Northern Wolffish (Page 188) and Spotted Wolffish (Page 191).)

P. 185 Atlantic Wolffish Habitat and Distribution section – wolffish are found over a variety of substrates (not just “hard clay bottom”), and at depths less than 25 m, and in excess of 250 m.

P. 185 Atlantic Wolffish Use and Importance – the fact that this species can be retained under SARA, unlike the other two, deserves mention, even if this species is not “commercially significant”

P. 186 Cusk Biology and Ecology section – fish species are an important component of the Cusk diet (Bowman et al. 2000)

P. 186 Cusk Use and Importance section – worth mentioning that Cusk is monotypic species in NW Atlantic

P. 188 Northern Wolffish Habitat and Distribution section – “occurs in Arctic seas on both sides of the North Atlantic Ocean” should be rewritten. It occurs in both Arctic and Atlantic Oceans. So do other wolffish species, though no mention of this is made. The fact that it is more pelagic than the other two species should also be noted.

P. 188 Comment: It is stated on Table 4.62 that Northern Wolffish is distributed as a ‘widespread self-assemblage’, whereas in fact Northern Wolffish are mostly found along the shelf edge, not on the shelf.

P. 190 Roughhead Grenadier Habitat and Distribution section – Lorange et al. (2008) is relevant to the Northeast Atlantic, only. A publication by Edinger et al. (2007) contains information on this species in NL waters. Specifically, it reports that Roughhead Grenadier were found in association with deep-sea corals, such as gorgonians, antipatharians, and soft corals, at depths of 200-1000 m.

P. 190 Roundnose Grenadier Habitat and Distribution section – Lorange et al. (2008) is relevant to the Northeast Atlantic, only. In the NW Atlantic, the species has been caught at depths less than 400 m. The data provided for NL comes from Parsons 1976. Newer information is available, in Power and Maddock Parsons (1998) and Kulka (2001). Most catches of this species occurred at depths of 900 m or more.

P. 190 Spotted Wolffish Biology and Ecology section – spawning in late autumn and early winter was suggested by Templeman 1966. A more recent publication (Templeman 1986) suggested mid to late summer spawning (July-August-Sept).

P. 191 White Hake Habitat and Distribution section – white hake occur at depths much less than 200 m. On the western St. Pierre Bank, and southwest slope of the Grand Bank, they frequently occur at around 100 m (Han and Kulka 2007). Juvenile White Hake are commonly found inshore, and may even occupy estuaries. Why the reference to Longfin Hake (*U. chesteri*)?

P. 191 White Hake Biology and Ecology section – not all juveniles are pelagic. The juvenile stage of the life cycle is characterized by pelagic and (later) demersal components.

P. 192 Winter Skate Biology and Ecology section – Kelly and Hanson (2013) estimated that 40-70 egg cases are deposited each year. Also, cephalopods (squid) are an important component of the diet.

P. 195 Comment: It is stated that Capelin spawning sites are known to occur in offshore areas (the example used was the Southeast Shoal in NAFO Div. 3O). To my knowledge no offshore spawning site has been identified, but inferences about it have been postulated based on the observation of mature capelin found in the offshore, as well the presence of larvae and early life stages.

P. 196 Shortfin Mako Biology and Ecology section – cephalopods are a major component of the diet.

P. 196 White Shark Biology and Ecology section – White Sharks reproduce via internal fertilization, and development is characterized by aplacental viviparity (also known as ovoviviparity) with embryonic oophagy. See Saïdi *et al.* 2005.

P. 199 last paragraph. The word 'represent' is misspelled.

P. 220 last sentence. 'American long line fishery' American Plaice?

P. 233-235. No units are shown in Figures 4.91 through 4.93.

P. 396 last bullet. Comment: This sentence is vague, direct mortality of marine organisms (at various stages of development) resulting from exposure to oil pills should be stated explicitly here.

Richards, Dale E

De: Koen-Alonso, Mariano
Envoyé: April-03-14 4:13 PM
À: Richards, Dale E
Cc: Clarke, Keith; Mansour, Atef A H
Objet: RE: comments on CNLOPB SEA
Pièces jointes: Comments on the CNLOPB Eastern Newfoundland Strategic Environmental Assessment
MKA.docx

Hi Dale,
Attached it goes a word file with my comments on the CNLOPB Eastern Newfoundland Strategic Environmental Assessment. If you need any clarification or further details, just let me know. Sorry again for the delay.
Take care, cheers, and good luck,
Mariano

Mariano Koen-Alonso
Northwest Atlantic Fisheries Centre | Centre des pêches de l'Atlantique Nord-Ouest
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Government of Canada | Gouvernement du Canada

From: Richards, Dale E
Sent: April-02-14 10:59 AM
To: Koen-Alonso, Mariano
Subject: RE: comments on CNLOPB SEA

Tomorrow is okay. I am snow locked today and suspect I will be working into tomorrow evening to finish this one.

From: Koen-Alonso, Mariano
Sent: Wed 02/04/2014 10:30 AM
To: Richards, Dale E
Subject: comments on CNLOPB SEA

Hi Dale,
Just to let you know that I am finishing my comments on the SEA. I know that the deadline for comments is today, but I was wondering if it is a big problem if I send them tomorrow.
Thanks,
Mariano

Mariano Koen-Alonso

Northwest Atlantic Fisheries Centre | Centre des pêches de l'Atlantique Nord-Ouest

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Comments on the CNLOPB Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft Report (February 2014)

by Mariano Koen-Alonso

General comments

This report is intended to identify and incorporate environmental considerations at the earliest stages of planning and decision making, and hence is expected to be broad in its scope, and relatively general in its description of potential impacts associated with oil and gas exploration and/or production in the region within the next decade. Therefore, although specific details are important, it is fundamental that the SEA provides a complete and comprehensive system-wide perspective in order to be useful.

In this general context, the document provides a large volume of information, but it is not necessarily comprehensive for all the considered Valued Ecosystem Components (VECs), and in the specific case of Commercial Fisheries, it could even be considered misleading. Most of my concerns can be traced back to a lack/incomplete consideration of the activities (both fishing and research) associated with the Northwest Atlantic Fisheries Organization (NAFO). The process of developing this SEA would have benefited from the inclusion of NAFO representation in the SEA Working Group.

Based on my expertise, the most critical issues I found in the SEA include:

- 1) Partial survey information and lack of understanding of the limitations of the DFO trawl surveys, especially in terms of its ability to sample invertebrates.
- 2) Poor description of the ecosystem structure in the SEA study area (e.g. trophic structure, ecoregion configuration, linkages between the Grand Bank and the northern Newfoundland shelf, bottom up regulation of ecosystem productivity)
- 3) Incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species, including distribution and potential impacts of oil and gas exploration/production and spills.
- 4) Incomplete (and potentially misleading) description of fishing activities due to the absence of data for the international fleets operating outside the EEZ and regulated by NAFO.

Detailed comments

1. Partial survey information and lack of understanding of the limitations of the DFO trawl surveys.

The SEA only considers research survey information from DFO, but survey programs conducted by the European Union (EU), and/or some of its member states, exist. These research surveys focused on the Flemish Cap, but also on the nose and tail of the Grand Bank, are routinely used by NAFO Scientific Council to assess fish stocks in the area, as well as ecosystem structure and interactions. These sources of information have not been considered in the SEA. There are numerous NAFO documents and papers describing and analysing data from these surveys (e.g. NAFO 2010a, 2010b, 2011, 2012a, Perez-Rodriguez et al. 2011, 2012, Nogueira et al. 2013).

The SEA mentions the changes in areal coverage and gear in the DFO surveys (page 161), but when it indicates that 4 invertebrate species had passed its screening process, it fails to recognize that only shrimps and crab had been consistently recorded in DFO surveys since the switch to the Campelen gear in 1995-1996, so it is impossible to establish if other invertebrates (e.g. brittle stars and/or sea urchins, just to name some potentially high abundance species) could have met or not the SEA screening criteria. Consistency in the recording of invertebrates in DFO surveys has been improved in recent years, and as part of the DFO Ecosystem Research Initiative (ERI) NEREUS Program during

2007-2010, a grab sampling program was implemented in soft bottoms of the Grand Bank (e.g. DFO 2012, Gilkinson 2012). These results are not included in the SEA.

2. Poor description of the ecosystem structure in the SEA study area.

The SEA study area actually expands over at least four different functional ecosystem production units: a) the Grand Bank, b) the Newfoundland-Labrador Shelf, both of them part of the Newfoundland-Labrador Shelves marine ecosystem, c) the Flemish Cap, which is considered a relatively closed marine ecosystem, and d) the oceanic waters beyond the continental shelf break. Furthermore, it includes the transition areas between these ecosystems, and given the large range in depths involved in SEA study area, it can also be argued that it expands over bathypelagic and abyssal oceanic ecosystems. These very basic descriptions, and their potential implications, are completely absent in the SEA.

For example, the basic ecoregion structure in the Grand Bank indicates that the Grand Bank and the Labrador-Newfoundland Shelf can be considered ecosystem sub-units, where the northern Grand Bank (NAFO Division 3L) acts as a transition zone between these subunits. It is also clear the existence of a distinct shelf-break ecoregion, which acts as a transition zone (ecotone) between shelf and oceanic realms (Pepin et al. 2010, NAFO 2010b, 2012a). The Flemish Cap also emerges as a distinct ecosystem production unit (Perez-Rodriguez et al. 2010, NAFO 2010b), and both the Grand Bank and Flemish Cap are being considered candidate ecosystem management units for the development of ecosystem approaches to fisheries by NAFO (NAFO 2010b).

Although the Newfoundland-Labrador Shelves and Flemish Cap had experienced collapses of major groundfish components, and share many of their core species, the structure of these ecosystems is not identical. For example, the key forage species in the [southern] Grand Bank are sand lance and capelin, shrimp and capelin in the [northern] Newfoundland-Labrador Shelf, while in the Flemish Cap redfish and shrimp have been key prey species for that ecosystem (NAFO 2010b, 2011, 2012, Perez-Rodriguez et al. 2011, 2012). Furthermore, in the NL shelves, there is evidence of bottom-up regulation of capelin, its overall core forage fish species, with linkages between environmental drivers (e.g. ice dynamics), phytoplankton blooms, zooplankton abundance, and capelin dynamics (DFO 2012, Buren et al. 2014), and where the dynamics of upper trophic levels (e.g. Atlantic cod) seem to have been driven by availability of food (capelin) and fishing (DFO 2012, Buren et al, submitted). The influence of ice dynamics on ecosystem trends is not observed in the Flemish Cap (NAFO 2011), where besides the impact of fishing, environmental drivers seem to be influencing recruitment success, while predation by top predators appears to regulate the dynamics of juvenile and smaller fishes (Perez-Rodriguez et al 2013), and where strong trophic interactions are linking the core species (cod, redfish and shrimp) in the Flemish Cap ecosystem (NAFO 2011, 2012a).

The above brief summary is provided here simply to highlight that a) the basic ecosystem organization and dynamics that exists in the SEA study area is not described by the SEA document, and b) there are analyses and information available to produce the strategic/broad base description that could provide managers/decision makers with a more functional and holistic perspective of the ecosystems that are potentially affected by oil and gas development. The current SEA does not describe functional ecosystem units, nor attempt to analyze impacts on their structure and function; it simply provides a list of components and compiles potential effects on them, not on the system as a whole. This type of description is useful but not complete, and has the risk of promoting "tunnel vision" approaches to management issues.

3. Incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species

Over the last 5-7 years, there has been a large research effort devoted to the identification, characterization, and mapping of Vulnerable Marine Ecosystem (VME) indicator species within the SEA study area. Most of this work has been done under the umbrella of NAFO, and through the NAFO Scientific Council (SC) Working Group on Ecosystem Approaches to Fisheries Management (WGEAFM), which has recently been renamed SC Working Group on Ecosystem Science and Assessment (WGESA). Most of this work is not included nor mentioned in the SEA document. Furthermore, some recent and relevant studies like Baillon et al (2012) and Beazley et al (2013) are referenced in the text, but absent in the references section, and some of their implications not included in the document. For example, Baillon's study documents the linkage between seapens (corals) and redfish larvae, and makes the case for seapen fields to be considered essential fish habitat for redfish. This potentially critical role of seapen fields for redfish is absent from Table 4.62 (overview of key groundfish species in the SEA area), and there is no mention of this linkage in Table 5.1. (fish and fish habitat potential environmental interactions).

Also, sponge grounds are among the more abundant VME indicator species in the SEA study area, but little attention is paid in Table 5.1. to the impacts of potential spills on these large grounds of filter-feeding, habitat forming species, and the spill simulations described in SEA seem to focus on either shoreline/surface impacts or highlights that spills will drift east (beyond 50°W). No attempt to assess the impact of these trajectories on VMEs is made, even though potentially damaging biogenic essential fish habitat could have serious long term impacts on ecosystem productivity.

These details seem to suggest that the "corals and sponges" section (page 180) was put together/updated without carrying through its implications into other sections of the SEA.

Furthermore, although corals and sponges have been the initial focus in the study of VMEs, many other taxa have been identified as VME indicator species, including tube-dwelling anemones, erect bryozoans, and crinoids, and several physiographic features (e.g. seamounts, canyons, the Southeast shoal) have been identified as VME elements because they contain (or are likely to contain) VMEs (NAFO 2012). These other VME components are not really discussed in the SEA nor is an assessment of the potential impact of Oil and Gas exploration/production on them.

Many of the NAFO reports from the Scientific Council meetings since 2008, and the reports from the SC WGEAFM (and references within) summarize most of the available information on VMEs in the SEA study area. These reports should be used not just to describe what is known on VMEs, but also to inform/construct scenarios for spill simulation studies.

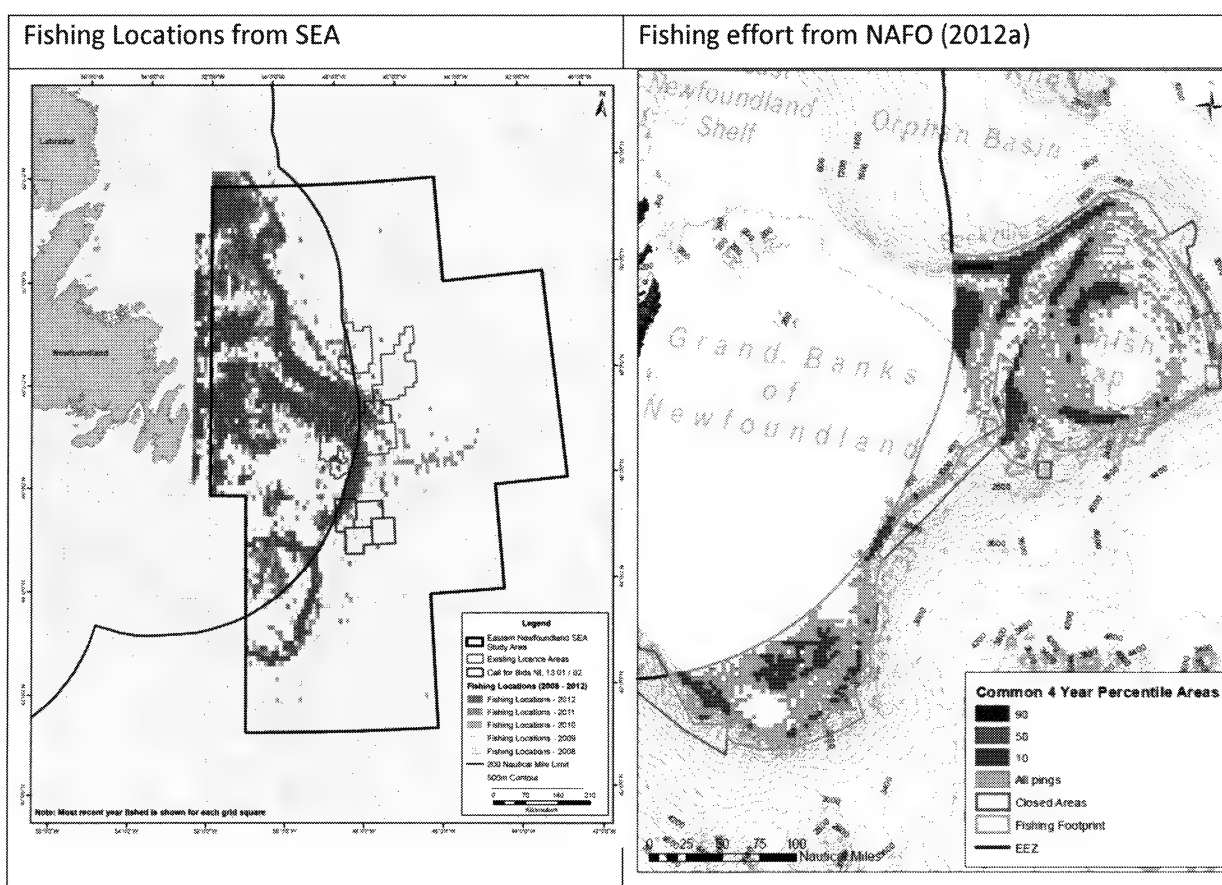
Although not yet available, the upcoming NAFO SC WGESA report (to be released in May 2014) will also contain an updated summary on VMEs, and an analysis of adequacy for current NAFO VME closures. This report will also contain recent findings that suggest that VME areas may be linked to higher fish densities, highlighting the potential importance of these areas for overall ecosystem production. Although it would have been impossible for the SEA drafting team to know these latest unpublished results when putting the SEA document together, the participation of NAFO within the Working Group could have made them aware of this ongoing work, and possibly made available some of the preliminary results for the SEA drafting team.

Another important source of information that would be useful to track for preparation of the final version of the SEA is the report of a Convention on Biological Diversity (CBD) Regional Workshop that took place in Montreal, on 24-28 March 2014 and was intended to facilitate the description of

ecologically or biologically significant marine areas in the Northwest Atlantic. The international waters within the SEA study area were part of the area considered by this CBD workshop.

4. Incomplete (and potentially misleading) description of fishing activities

Virtually the entire section 4.3.4 (marine fisheries) is constructed on the basis of Canadian fisheries, or foreign fisheries which land their catches in Canadian ports. This is an incomplete and limited view of the fishing activities that take place in the SEA study area. The entire section portrays a distribution of fishing activities that completely misses the international fisheries operating outside the EEZ and managed by NAFO, and most of the maps could misled an uninformed reader to believe, for example, that there is essentially no fishing going on in the Flemish Cap, or that the Sackville Spur has no fishing whatsoever, when in reality this is one of the areas in the region that has the highest levels of fishing effort (e.g. NAFO 2012a). Just for the sake of a general visual comparison I am copying below the Figure 4.122 in the SEA (commercial fishing locations in 2008-2012) and Figure 4.2.2.1.7 from NAFO (2012a) (common fishing effort areas derived from VMS data in 2008-2011).



I want to be explicit on one thing, I am **not** trying to imply that these omissions and shortcomings are intentional, but nonetheless they effectively render useless the entire analysis of marine fisheries. The SEA states in its page 441 that *"Although the DFO datasets are known not to be comprehensive, particularly with regard to important inshore fisheries, the information provides a useful regional picture of fishing activity in the area that is considered adequate and appropriate for*

the purposes of the SEA". Based on the comparison of the figures above, I strongly disagree with this statement. Without integrating the information from Canadian and international fisheries it is impossible to assess if the picture provided is adequate and appropriate. The entire section should be redone incorporating the international fishing effort data. These data, in some kind of aggregated format, could be requested from the NAFO Secretariat for its inclusion and integration in the SEA.

Concluding remarks

The SEA document contains a large volume of information, and compiles a lot of valuable data, but it is not complete; it fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them). The document misses important and basic considerations on ecosystem structure and function, does a poor job at exploring potential impacts on ecosystem functioning, and gives a partial depiction of the fishing activities that takes place in the study area. As a strategic environmental assessment that is expected to last for a decade it falls far short from the mark. It needs major changes/updates before it can become a reliable source of guidance for policy and management decision-making.

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Document 12/19. Serial No. N 6072.

- Pepin, P., A. Cuff, M. Koen-Alonso and N. Ollerhead. 2010. Preliminary analysis for the delineation of marine ecoregions on the NL shelves. NAFO SCR Doc. 10/72. Serial No. N5871.
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- Beazley, L. I., Kenchington E. L., Murillo, F. J., and Sacau, M. 2013. Deep-sea sponge grounds enhance diversity and abundance of epibenthic megafauna in the Northwest Atlantic. – ICES Journal of Marine Science, doi:10.1093/icesjms/fst124.

Richards, Dale E

De: Sjare, Becky
Envoyé: April-07-14 3:15 PM
À: Richards, Dale E
Objet: Richards_Lawson_SEA Review

Importance: Haute

s.19(1)

s.21(1)(b)

Hi Dale,

So, here are my comments
so that you can work on them.
The whale stuff is pretty good.

Cheers,

BEcky

From: Sjare, Becky
Sent: April 7, 2014 12:12 PM
To: Lawson, Jack
Subject: Lawson_SEA Review
Importance: High

FYI

Here is the text I have. Maybe you don't have too much more to add. Tweek as you see fit.

BS



AB_2014_SEA_East
NL_Sjare ...

SEA – Eastern NL – Marine Mammals – Sjure

Given the objectives of the SEA, the document is generally well written. I quickly read through parts of Section 4 (Climatology, Oceanography and Ice). I looked more closely at the marine mammal text and aspects of Section 5.

1a) Perhaps most pertinent to Section 4 (physical setting text) is the lack of a comprehensive overview on climate change. This needs to be addressed.

There are a few statements regarding climate change but nothing substantive. There should be general information on the most current projections relative to air and sea temperatures, currents, primary productivity and changes in frequency of extreme weather based on regional climate change models. Which models are considered best right now for the study area in question? Where are the data gaps and key uncertainties? These projections should be integrated into subsequent areas of text throughout the SEA as required (e.g. the sections on ice and ice bergs as well as in the species accounts where information is available).

Section 4.1.4.4 on Extreme Wind and Wave Events partially captures the level of integration and comprehensiveness that is required to make all the information presented useful. However, it lacks a climate change context and this is a problem.

Section 4.2.1.8 Environmental Influence and Changes does provide useful information on climate change on fish and invertebrates; however, the context needs to be improved with the addition of information of the role of the NAO and more comprehensive text on climate change generally (either in the existing text or earlier in sections on the physical environmental setting).

1b) There are sections of text where the data sets used seemed dated – eg. DFO fish survey data up until 2009; Sea Ice Atlas to 2010; some tropical storm data to 2000; MSC50 wave/current data to 2011 ect. It is understandable that some data sets may not available after the said date. However, it seems likely that some are (i.e. the most recent tropical storm data would be very informative and links back to comment 1a). This needs to be clarified for the reader. If a data set is 'prematurely' truncated or not being used for some reason – it should be stated. If there are additional data, then it should be noted when they are likely to become available.

2) Section 4.2.3.3 on Pinnipeds needs to be expanded so that harps, hoods and grey seals are treated separately in the summary table (i.e. in the same manner key whale species were). Although there are similarities in the ecology of harps and hoods, there are enough differences that lumping both species together results in a summary table with content that is too general to be useful.

The timing and use of ice habitat for whelping needs to be a focus for each of these two species. There is also a climate change aspect that should be presented and discussed (there is published literature on this topic as well as new information becoming available pers. comm. Garry Stenson).

Note that a recent publication on satellite movements of hooded seals indicates that there is significant feeding along the shelf edge to the east of the 'Northeast Shelf Slope' EBSA. Check Andersen, J. et al. 2012. Habitat selection by hooded seals in the Northwest Atlantic Ocean. ICES J of Marine Science.

Note that there are likely harbour seals present along the southern shore of the Avalon Peninsula for most of the year in addition to the Bays along the south coast.

Note that this March the Convention on Biological Diversity conducted a science advisory workshop to delineate EBSAs in the Northwest Atlantic Area beyond the 200 mile limit. One area that was identified was the shelf break area from the Lilly/Carson Canyon area extending northward to 48° N.

3) The sections on Important Areas and Times for each of the key VEC species groups (e.g. Marine Mammals and Sea Turtles - 5.3.3.2) have considerable repetition from earlier sections of text. Some of this is warranted, but there should also be an effort to link this information with the appropriate mitigation measures presented in each of the preceding sections of text.

4) The section of text on Cumulative Environmental Effects 5.6 is very superficial as presented. The proponents state that this is because upcoming projects and their footprints are unknown. However, there is not even an explanation on how cumulative effects are currently being assessed nor is there acknowledgment and discussion on the advancements in cumulative effects research in recent years. These problems need to be corrected.

It should be noted that this March, DFO conducted a National Science Advisory Process to develop a new framework for large project cumulative effects on marine mammals. Contact J. Lawson for details on when this information will become available.

Regarding the issue of unknown projects and unknown project foot print sizes as an explanation for providing no relevant industry information - elsewhere in the document and on the C-NLOPB web site there are indications that ten EA documents are in process. At the very least, an overview and time line of these activities should be presented.

Gregory, Robert

From: Gregory, Robert
Sent: April 8, 2014 4:14 PM
To: Richards, Dale E
Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft -
Deadline for comments April 2, 2014

Hi Dale,

Here you are.

Cheers,

Bob



Eastern
Newfoundland ...

Dr. Robert S. Gregory, Research Scientist
Director, Centre of Expertise for Aquatic Habitat Research
Ecological Sciences Section
Fisheries & Oceans Canada
80 E. White Hills Rd., PO Box 5667 St. John's NL A1C 5X1 CANADA

1-709-772-4491 phone
1-709-772-5315 fax
email: Robert.Gregory@dfo-mpo.gc.ca

From: Richards, Dale E
Sent: April 8, 2014 10:48 AM
To: Gregory, Robert
Cc: Anderson, M. Robin
Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments
April 2, 2014

Thanks for the update Bob. The memo is due with FPP tomorrow.

At this point, I am awaiting input from yourself and Robin.

Please send it along when completed.

This will be a lengthy Branch response/memo!

From: Gregory, Robert
Sent: April 8, 2014 10:27 AM
To: Richards, Dale E
Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments April 2, 2014

Hi Dale, I am still attempting to get you material on this item. I am almost finished. Should be done later today. Cheers,
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Dr. Robert S. Gregory, Research Scientist
Director, Centre of Expertise for Aquatic Habitat Research
Ecological Sciences Section
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1-709-772-4491 phone
1-709-772-5315 fax
email: Robert.Gregory@dfo-mpo.gc.ca

From: Clarke, Keith
Sent: March 10, 2014 9:22 AM
To: Anderson, M. Robin; Gilkinson, Kent; Gregory, Robert; Koen-Alonso, Mariano; Loughlin, Kristin G; McKenzie, Cynthia; Morris, Corey; Ollerhead, Neil; Payne, Jerry F; Wareham, Vonda; Wells, Nadine
Subject: FW: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments April 2, 2014
Importance: High

Not sure who I sent this to originally, but the final documents are now available for review if you will have the time and were asked originally.

Keith

From: Richards, Dale E
Sent: 2014-March-07 3:40 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Sencially, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason; Sooley, Darrin; Wells, Nadine; Nakashima, Brian; Hamoutene, Dounia
Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments April 2, 2014
Importance: High

Good afternoon,

Following several delays, the 'Draft' Eastern Newfoundland SEA has finally been posted on the CLNOPB website. It can be accessed at the following link: <http://www.cnlopb.nl.ca/enlsea.shtml>. The full SEA document along with the associated SEA appendices have also been posted on the shared Science drive under the Science folder: Science Info/CSA Review/ Habitat/ SEA & EA/ Eastern NL SEA March 2014

request. Please note that I have not removed the 'Eastern NL SEA December 2013' files from the shared folder by chance that someone wishes to compare the two draft versions. However, if you have not commenced your review please be sure to use to the most recent version of these SEA files.

To date I have received a few submissions pertaining to this request and this content will be included in the Science response memo. To those Sections that still intend on sending along comments or additional revisions the CSA Office will require such submissions by **April 2nd**.

Listed below are specific Sections of the EA Report which require Science review:

Environmental Setting

- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Sensitive and Special Areas (note revised title)
-

Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
- Section 5.3 – Marine Mammals and Sea Turtles (including Species at Risk and Other Key Species)
- Section 5.4 – Sensitive and Special Areas (note revised title)

Please give me a call if you have any questions on this process.

Thank you,
Dale

From: Richards, Dale E

Sent: January 31, 2014 1:47 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

Good afternoon,

There has been a further delay in the submission of the Eastern Newfoundland SEA for review. The latest I have received from the FPP (via the CLNOPB) is that the 'final' draft report will be made available to us for review the end of February. I will continue to keep you updated as CSA receives any information.

Dale

From: Richards, Dale E

Sent: January 7, 2014 12:59 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

The CLNOPB has advised that the submission of the 'final' draft report - Eastern Newfoundland SEA - to FPP will be delayed until the end of January. This 'final' draft will be an update to the 'preliminary' Draft #1 version highlighted in the e-mail below and posted on the Science shared drive prior to the Christmas break. Based on this information, we know that an extension on this request for advice will be forthcoming. Thus, it may be advisable to delay your review of the preliminary draft of the SEA report until the final draft becomes available.

As soon as the CSA Unit receives an update from FPP, I will send out a revised deadline to this request. At this point, a 3-week delay to obtain the 'final' draft SEA is anticipated.

Please give me a call if you have any questions on this process.

Thank you,
Dale

From: Richards, Dale E

Sent: December 23, 2013 4:56 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comments January 20, 2014

Good afternoon,

In consultation with the RDS-Office, the CSA Unit has decided that based on the timing of this request and the draft nature of the Eastern Newfoundland SEA report that this request for advice will be provided to Ecosystems Management via a memo. i.e. there will be no formal Science meeting or SSRP process at this time. To that end, comments on the SEA report will be needed by the CSA office by **Monday, January 20th**. This will allow the CSA Unit a few days to compile the comments.

Section heads, please ensure that this request and deadline is sent to the appropriate scientist within your section. For your reference, the original e-mail is provided below.

If you have any questions, please let me know.

Thank you,
Dale

From: Richards, Dale E

Sent: December 2, 2013 2:19 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry

Subject: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comment mid-January 2014 - Please action

Good afternoon,

CSA has received, from the FPP (via the C-NLOPB) for review, the Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1.

DFO is providing expert advice, to support the C-NLOPB, on baseline conditions (i.e. environmental setting) and mitigations related to potential impacts of oil and gas activities on fish, fish resources, SAR, sensitive areas and DFO research activities.

To provide context related to the SEA process please see Section 2: SEA - Scope and Approach.

The Science review should focus on whether the baseline information is accurate and that the effects assessment, taking into consideration departmental guidance such as the "Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment"

Listed below are specific Sections of the EA Report which require Science review and comments:

Environmental Setting

- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Protected and Other Designated Sensitive Areas
-

Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
- Section 5.3 – Marine Mammals and Sea Turtles (including Species at Risk and Other Key Species)
- Section 5.4 – Sensitive Areas

The FPP has requested that Science provide comments by the end of January. In the interim, until a Branch decision has been made on how this request for advice is going to be handled (i.e. memo or SSRP process), I have placed the SEA report on the shared drive in the '**CSA Review**' folder, subfolder '**Eastern Newfoundland SEA - December 2013 Request**'. This will allow the maximum time available to Science to review and provide comment on the report. Whether a SSRP process takes place or a memo is formulated, I suspect that comments will be required from individual scientists by **mid-January 2014**. I will be in touch at a later date regarding specific deadlines and what format this request for advice will take.

As always, if you have any questions please let me know. Section heads, please ensure that this request is sent to the appropriate scientist within your section.

Thank you,
Dale

E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

Newfoundland and Labrador Region / La Région de Terre-Neuve et du Labrador

Fisheries and Oceans Canada / Pêches et Océans Canada

80 East White Hills Road, PO Box 5667, St. John's, NL A1C 5X1

Tel: (709) 772-8892

Fax/ Télécopieur: (709) 772-6100

E-mail / Courriel: Dale.E.Richards@dfo-mpo.gc.ca

Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO

<http://www.dfo-mpo.gc.ca/csas-sccs/>



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of Canada

Gouvernement
du Canada

MEMORANDUM

NOTE DE SERVICE

To
À Dale Richards
Centre for Science Advice
Science Branch, NL Region

From
De Dr. Robert S. Gregory
Research Scientist – Fisheries Habitat Research
Ecological Sciences Section
Science Branch, NL Region

Subject
Objet Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft February 2014 – review

Security Classification - Classification de sécurité
Non classifié/Unclassified
Our File - Notre référence
Your File - Votre référence
Date
April 8, 2014

Dale,

I have examined the above SEA report. In order to facilitate my review and place my comments in their appropriate context, I have read the entire report. I then examined the following sections of the report in detail – Sections 4.1.4, 4.1.5, 4.2.1, 4.2.4, 5.1, 5.4, and 6.1.

The report appears to be complete in most respects – I identified no substantive errors or omissions. On the next page, I have included some specific points and comments.

If I may be of further assistance, please let me know.

Sincerely,

Bob Gregory (4491)

See following page for specific points.

1. Page 47, Table 3.4 These numbers are not standardized per unit time or capacity; therefore, they are misleading. What are the "lifespans" of the wells in this table – i.e., how many of the 29,527 wells in the 1980's were also operational in the 1970's (and hence double counted)? The total number operating during each period may reduce the apparent blowout frequency by referencing existence in more than one of the time periods. The number of operating wells in 1971-80 plus the number of "new wells" minus the number of "decommissioned wells" would be a more meaningful number in this column in this comparison. The number of exploration vs production wells would be very revealing also, in my opinion, revising the blowout instances per unit time of well operational life would be more informative than the numbers reported here.

2. Page 58, Table 3.8 Subsequent comments below the table (in the text of the page) suggest that 2% is some form of benchmark for oil spill dispersion rate. What is the basis for reliance on such a number? What is the reference authority for this number and is it an ecologically useful number?

3. Page 181, Table 4.61 The final column of this table is difficult to read - first the number of digits after the decimal is inconsistent and the column is center justified, both of which are inappropriate formats for displaying such data. Change to right justified and constant number of digits after the decimal; I suggest one digit past the decimal to be sufficient (occurrence is a "summary" statistic after all - the precision is unwarranted).

4. Page 184-196, Table 4.62 & 4.63. This table is listed alphabetically by species. This is a rather arbitrary order and makes no ecological or taxonomic sense. The order of the species in the table should be taxonomic to permit grouping of species into various logical ecological groups.

5. Page 197, Table 4.64. The superscript #4 (for Atlantic cod) in the table has no corresponding footnote reference on the final row of the table.

6. Page 200, Table 4.65. Much is made in the accompanying text around this table, of the inflated representation introduced by comparing numbers among various body sizes (e.g., cod vs sand lance). I agree to is important – so much so that I suggest a Table be added as a companion to this one, which reports not numbers, but weight of catch by species reflecting the biomass of the various species in the SEA area.

7. Page 218-224, Section 4.2.1.7 Other than a line in one of the tables in this section of the report, there is no mention of Atlantic cod, despite the existence of a published Atlantic cod Recovery Potential Assessment in 2011 (DFO-CSAS). This omission must be rectified.

8. Page 227, Table 4.67. First row (green crab); this species is also one of the few AIS which are known to destroy fish habitat (i.e., eelgrass), thereby affecting recruitment of some species (e.g., Morris et al 2010 CSAS Res Doc)

Richards, Dale E

De: Anderson, M. Robin
Envoyé: April-08-14 4:24 PM
À: Richards, Dale E
Cc: Clarke, Keith
Objet: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft -
Deadline for comments April 2, 2014

Hi Dale,
Here is my review [REDACTED] I got bogged down in the last sections which were [REDACTED] lacking in
important info.
If you have any questions please contact me,
Cheers,
Robin

s.19(1)



Review of the
Eastern Newfou...

M. Robin Anderson, PhD
Marine Habitat Research Scientist
Ecological Sciences Section
Environmental Science Division
Science Branch, Fisheries and Oceans Canada
POBox 5667
St. John's, NL A1C 5X1
CANADA
ph:709-772-0460
fax:709-772-5315
email:m.robin.anderson@dfo-mpo.gc.ca

From: Richards, Dale E
Sent: April-08-14 10:48 AM
To: Gregory, Robert
Cc: Anderson, M. Robin
Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments
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Thank you,
Dale

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Sent: January 31, 2014 1:47 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine

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Thank you,
Dale

From: Richards, Dale E

Sent: December 2, 2013 2:19 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry

Subject: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comment mid-January 2014 - Please action

Good afternoon,

CSA has received, from the FPP (via the C-NLOPB) for review, the Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1.

DFO is providing expert advice, to support the C-NLOPB, on baseline conditions (i.e. environmental setting) and mitigations related to potential impacts of oil and gas activities on fish, fish resources, SAR, sensitive areas and DFO research activities.

To provide context related to the SEA process please see Section 2: SEA - Scope and Approach.

The Science review should focus on whether the baseline information is accurate and that the effects assessment, taking into consideration departmental guidance such as the "Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment"

Listed below are specific Sections of the EA Report which require Science review and comments:

Environmental Setting

- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Protected and Other Designated Sensitive Areas

Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
- Section 5.3 – Marine Mammals and Sea Turtles (including Species at Risk and Other Key Species)
- Section 5.4 – Sensitive Areas

The FPP has requested that Science provide comments by the end of January. In the interim, until a Branch decision has been made on how this request for advice is going to be handled (i.e. memo or SSRP process), I have placed the SEA report on the shared drive in the '**CSA Review' folder, subfolder ' Eastern Newfoundland SEA - December 2013 Request'**'. This will allow the maximum time available to Science to review and provide comment on the report. Whether a SSRP process takes place or a memo is formulated, I suspect that comments will be required from individual scientists by **mid-January 2014**. I will be in touch at a later date regarding specific deadlines and what format this request for advice will take.

As always, if you have any questions please let me know. Section heads, please ensure that this request is sent to the appropriate scientist within your section.

Thank you,
Dale

E. Dale Richards, B.Sc. Hons., M.Sc.

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Review of the Eastern Newfoundland Strategic Environmental Assessment

By M. Robin Anderson

April 7th, 2014

As requested, I have reviewed the *Eastern Newfoundland Strategic Environmental Assessment Draft Report* and have the following comments.

Overall the summary of the existing environment is reasonably complete for the area of the Strategic Environmental Assessment (SEA) that falls inside the 200 mile limit however, specific information for the offshore (>200 mi.) and in particular the Flemish Cap and Orphan Basin are lacking. The sections on potential environmental effects are rudimentary at best and fail to synthesize our current understanding of potential effects. This is also the case for the sections on interactions with other human activities including fishing and sensitive and special areas. The potential for cumulative effects is mentioned but not developed.

P39 Primary emissions from offshore production should explicitly list produced water since it is the largest waste stream.

P49-50 Spill data for NL offshore should be updated to include 2013. Discussion should include that may be due to aging or leaky infrastructure.

P55-58 Oils spills scenarios under ice should also be included in these tables where available. They are mentioned as part of some of the studies but not included in the tables.

P82 ¶2 Why is the explicit risk of a landslide (1/500) included here? The risks for other geohazards are not specified. This is also reported as a personal communication which is not helpful for future planning. Instead the section should be updated to include the anticipated report from NRCan with slope failure risk maps. This would provide operators with useful information at the planning stages.

P82 ¶3-4 A map of the features of the Orphan Basin described in this section should be included. They are not in Figure 4.3.

There are lots of Piper pers. comm. in this section – what happens if he gets hit by a truck? Since this is an area of active research and since the SEA is a living document, this section should be updated on a priority basis as the research is published.

P102 Precipitation These figures need a better explanation for the y-axis. Does the frequency of occurrence (%) refer to event duration per month or number of events per month or per day?

The data for frequency of thunderstorms looks odd. 4.26 has a big spike in July while 4.28 has a big dip in September. Are these real or the result of calculation errors? Since this is a 63 year climatology it should not be related to sample size and interannual variability.

P164 Plankton The role of plankton in nitrogen and carbon cycling is not well explained. The term “biological pump” is misused. It does not refer to benthic pelagic coupling (which is an important process and should be explained) but rather to the sequestration of biogenic carbon in the deep ocean.

P165 The causal mechanisms of the spring bloom are incomplete. Onset of stratification and the interaction with light availability are key factors.

P166 Incorrect use of the term “biological pump”.

P168 This section is missing several important aspects of macroalgal communities. Several types of macroalgae in particular coralline algae have depth distributions well in excess of 30 m. Urchin-kelp-coralline algae dynamics are an important determinant of hard substrate communities in our waters (Himmelman & Steele, 1971). The substrate of the Grand Banks has been greatly disturbed by trawling which may affect the distribution of macroalgae. Fishing exclusion zones and artificial reefs may change this and provide refuges for macroalgae. Seaweed zonation with light is an important determinant of distribution. Seaweed communities are vulnerable to oil spills. Therefore coastal seaweed communities and their structure and function should be included in this section.

Benthic communities – general comment: Different types of benthic communities are sensitive to different types of disturbance. This should be discussed and summarized in a table for easy reference.

P172 Amphipod prey include much more than just seaweed and phytoplankton. They have many diverse and ecologically important feeding modes. Many are scavengers and some are aggressive predators.

P172 Polychaete information is not comprehensive. The available literature should be used to provide data on diet and ecological roles of these important members of the benthos.

P189 In the past, redfish larvae dominated the ichthyoplankton in many parts of the SEA area (Serebryakov et al. 1987).

P189 The introduction of invasive species and changes to habitat and/or community structure should also be discussed in the context of cumulative effects.

P399 Produced water effects should include increased nutrient loading and the ecosystem consequences for benthic pelagic coupling and production (Rivkin et al 2000).

The effects of drilling wastes on sensitive benthic species that cannot move away such as corals and sponges is not well understood. However, since they are filter feeders and known to be sensitive to increased sedimentation, organic matter loading and quality of suspended particulate material we can anticipate that they will be severely negatively affected. There is also very little information on the potential effects of seismic exploration on these organisms. These aspects should be highlighted as a critical information gap.

P400 2nd line Tannen et al is mis cited. The effects found relate to increased oxygen demand not oxygen enrichment. Produced water effects in this section are related to discharge not flaring. Rye et al 2003 is not in the list of references.

P400-401 This section is a very poor summary of other summaries. It is not comprehensive and will not serve as a useful reference. Our understanding has changed dramatically with the research following the Macondo blowout. This should be reflected in this summary.

P404 This section includes mitigations for ballast water introduction of invasive species but not for fouling organisms on hulls, drilling rigs or equipment. Protocols for mitigation of these introduction vectors should also be included in this section.

P421 The risk from ingestion of floating debris (i.e. plastic bags) for turtles should be discussed and garbage management and on shore disposal proposed as mitigations.

P426 This section implies that only designated VMEs and Coral Areas will be considered in this section. Other coral and sponge populations are only briefly referred to in the ecosystem overview and generally ignored in the assessment of potential effects.

There is no section on the potential effects of the environment (including other human activities) on oil and gas exploration and development.

P397 Table 5.1 is not adequate. This is a “summary of **some known... based on available sources**” is the header of column 3. It implies that the authors did not do a thorough job of reviewing and summarizing the existing literature. The table is incomplete and often cites reviews of reviews.

Section 5.6 The mitigation for cumulative effects is to reduce overlap of projects. This is not realistic. Overall this section is inadequate and does not summarize or address the potential for cumulative effects. It should include interactions between activities as well as thresholds for effects and consider climate, habitat and foodweb change as possible drivers.

Section 5.7 Coral and sponge effects and sensitivity should be identified as a significant information gap.

The SEA report is missing data on fish and fisheries from outside the 200 mile limit. NAFO data and reports for the area beyond 200 miles is ignored. For example, fig 6.3 is for Canadian vessels only. Campbell & Federizon (2013) provide data for fishing vessel activity in the areas governed by NAFO for 2011 and 2012. Such information should be combined with the fishing effort information from DFO to provide a complete picture of fishing in the SEA area.

P444 It is not clear what this note means. Does it mean that if DFO/NAFO want to extend the closure of the coral and sponge VMEs to other human activities that CNLOPB will include this in the SEA?

References

Campbell, N. & R. Federizon, 2013. ESTIMATING FISHING EFFORT IN THE NAFO REGULATORY AREA USING VESSEL MONITORING SYSTEM DATA. NAFO SCR Doc. 13/001

Himmelman, J H; D H. Steele, 1971. Foods and predators of the green sea urchin *Strongylocentrotus droebachiensis* in Newfoundland waters. Mar. Biol 9.4 :315-322.

Rivkin, R. B., R. Tian, M. R. Anderson, and D. Deibel, 2001. Ecosystem Level Effects of Offshore Platform Discharges- Identification, Assessment and Modelling. SETAC Globe 2(2).

Serebryakov, V P; Astafjeva, A V; Aldonov, V K; Chumakov, A K 1987. USSR Ichthyoplankton investigations on Flemish Cap, 1978-83. NAFO SCI. COUNC. STUD 11: 7-21.

Richards, Dale E

De: Richards, Dale E
Envoyé: April-11-14 9:51 AM
À: Templeman, Nadine
Objet: office update + SEA

Here is the SEA document – as mentioned, I am still working on the order of comments.

Note they are moving in your desk presently.



Memo RDS_
Eastern NF SEA- ...

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Canada

MEMORANDUM

NOTE DE SERVICE

To
À
▶ R. Finn
Regional Director Ecosystems Management

From
De
B. McCallum
Regional Director Science

Security Classification - Classification de sécurité Non classifié/Unclassified
Our File - Notre référence
Your File - Votre référence
Date April 10, 2014

Subject
Objet
**Review of the Eastern Newfoundland Strategic Environmental Assessment,
DRAFT REPORT #1**

The Fisheries Protection Program of the Ecosystems Management Branch recently requested a Science review of the "*Eastern Newfoundland Strategic Environmental Assessment (SEA) (AMEC November 2013).*" Comments have been provided by Science staff from the Ecological Sciences, Marine Mammals, Marine Fish Species at Risk and Pelagic Sections.

Ecological Sciences Section

General Comments

This report is intended to identify and incorporate environmental considerations at the earliest stages of planning and decision making, and hence is expected to be broad in its scope, and relatively general in its description of potential impacts associated with oil and gas exploration and/or production in the region within the next decade. Therefore, although specific details are important, it is fundamental that the SEA provides a complete and comprehensive system-wide perspective in order to be useful.

Overall the summary of the existing environment is reasonably complete for the area of the Strategic Environmental Assessment (SEA) that falls inside the 200 mile limit however, specific information for the offshore (>200 mi.) and in particular the Flemish Cap and Orphan Basin are lacking. The sections on potential environmental effects are rudimentary at best and fail to synthesize our current understanding of potential effects. This is also the case for the sections on interactions with other human activities including fishing and sensitive and special areas. The potential for cumulative effects is mentioned but not developed.

In this general context, the document provides a large volume of information, but it is not necessarily comprehensive for all the considered Valued Ecosystem Components (VECs), and in the specific case of Commercial Fisheries, it could even be considered misleading. Most of my concerns can be traced back to a lack/incomplete consideration of the activities (both fishing and research) associated with the Northwest Atlantic Fisheries Organization (NAFO). The process of developing this SEA would have benefited from the inclusion of NAFO representation in the SEA Working Group.

Based available expertise, the most critical issues found in the SEA include:

- 1) Partial survey information and lack of understanding of the limitations of the DFO trawl surveys, especially in terms of its ability to sample invertebrates.
- 2) Poor description of the ecosystem structure in the SEA study area (e.g. trophic structure, ecoregion configuration, linkages between the Grand Bank and the northern Newfoundland shelf, bottom up regulation of ecosystem productivity).
- 3) Incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species, including distribution and potential impacts of oil and gas exploration/production and spills.
- 4) Incomplete (and potentially misleading) description of fishing activities due to the absence of data for the international fleets operating outside the EEZ and regulated by NAFO.

Specific Comments

1. Partial survey information and lack of understanding of the limitations of the DFO trawl surveys.

The SEA only considers research survey information from DFO, but survey programs conducted by the European Union (EU), and/or some of its member states, exist. These research surveys focused on the Flemish Cap, but also on the nose and tail of the Grand Bank, are routinely used by NAFO Scientific Council to assess fish stocks in the area, as well as ecosystem structure and interactions. These sources of information have not been considered in the SEA. There are numerous NAFO documents and papers describing and analyzing data from these surveys (e.g. NAFO 2010a, 2010b, 2011, 2012a, Perez-Rodriguez *et al.* 2011, 2012, Nogueira *et al.* 2013).

The SEA mentions the changes in areal coverage and gear in the DFO surveys (page 161), but when it indicates that 4 invertebrate species had passed its screening process, it fails to recognize that only shrimp and crab have been consistently recorded in DFO surveys since the switch to the Campelen gear in 1995-1996, so it is impossible to establish if other invertebrates (e.g. brittle stars and/or sea urchins, just to name some potentially high abundance species) could have met or not the SEA screening criteria. Consistency in the recording of invertebrates in DFO surveys has been improved in recent years, and as part of the DFO Ecosystem Research Initiative (ERI) NEREUS Program during 2007-2010, a grab sampling program was

implemented in soft bottoms of the Grand Bank (e.g. DFO 2012, Gilkinson 2012). These results are not included in the SEA.

2. Poor description of the ecosystem structure in the SEA study area.

The SEA study area actually expands over at least four different functional ecosystem production units: a) the Grand Bank, b) the Newfoundland-Labrador Shelf, both of them part of the Newfoundland-Labrador Shelves marine ecosystem, c) the Flemish Cap, which is considered a relatively closed marine ecosystem, and d) the oceanic waters beyond the continental shelf break. Furthermore, it includes the transition areas between these ecosystems, and given the large range in depths involved in SEA study area, it can also be argued that it expands over bathypelagic and abyssal oceanic ecosystems. These very basic descriptions, and their potential implications, are completely absent in the SEA.

For example, the basic ecoregion structure in the Grand Bank indicates that the Grand Bank and the Labrador-Newfoundland Shelf can be considered ecosystem sub-units, where the northern Grand Bank (NAFO Division 3L) acts as a transition zone between these subunits. It is also clear the existence of a distinct shelf-break ecoregion, which acts as a transition zone (ecotone) between shelf and oceanic realms (Pepin *et al.* 2010, NAFO 2010b, 2012a). The Flemish Cap also emerges as a distinct ecosystem production unit (Perez-Rodriguez *et al.* 2010, NAFO 2010b), and both the Grand Bank and Flemish Cap are being considered candidate ecosystem management units for the development of ecosystem approaches to fisheries by NAFO (NAFO 2010b).

Although the Newfoundland-Labrador Shelves and Flemish Cap have experienced collapses of major groundfish components, and share many of their core species, the structure of these ecosystems is not identical. For example, the key forage species in the [southern] Grand Bank are sandlance and capelin, shrimp and capelin in the [northern] Newfoundland-Labrador Shelf, while in the Flemish Cap redfish and shrimp have been key prey species for that ecosystem (NAFO 2010b, 2011, 2012, Perez-Rodriguez *et al.* 2011, 2012). Furthermore, in the NL shelves, there is evidence of bottom-up regulation of capelin, its overall core forage fish species, with linkages between environmental drivers (e.g. ice dynamics), phytoplankton blooms, zooplankton abundance, and capelin dynamics (DFO 2012, Buren *et al.* 2014), and where the dynamics of upper trophic levels (e.g. Atlantic cod) seem to have been driven by availability of food (capelin) and fishing (DFO 2012, Buren *et al.*, submitted). The influence of ice dynamics on ecosystem trends is not observed in the Flemish Cap (NAFO 2011), where besides the impact of fishing, environmental drivers seem to be influencing recruitment success, while predation by top predators appears to regulate the dynamics of juvenile and smaller fishes (Perez-Rodriguez *et al.* 2013), and where strong trophic interactions are linking the core species (cod, redfish and shrimp) in the Flemish Cap ecosystem (NAFO 2011, 2012a).

The above brief summary is provided here simply to highlight that a) the basic ecosystem organization and dynamics that exists in the SEA study area is not

described by the SEA document, and b) there are analyses and information available to produce the strategic/broad base description that could provide managers/decision makers with a more functional and holistic perspective of the ecosystems that are potentially affected by oil and gas development. The current SEA does not describe functional ecosystem units, nor attempt to analyze impacts on their structure and function; it simply provides a list of components and compiles potential effects on them, not on the system as a whole. This type of description is useful but not complete, and has the risk of promoting “tunnel vision” approaches to management issues.

3. Incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species

Over the last 5-7 years, there has been a large research effort devoted to the identification, characterization, and mapping of Vulnerable Marine Ecosystem (VME) indicator species within the SEA study area. Most of this work has been done under the umbrella of NAFO, and through the NAFO Scientific Council (SC) Working Group on Ecosystem Approaches to Fisheries Management (WGEAFM), which has recently been renamed SC Working Group on Ecosystem Science and Assessment (WGESA). Most of this work is not included nor mentioned in the SEA document. Furthermore, some recent and relevant studies like Baillon *et al* (2012) and Beazley *et al* (2013) are referenced in the text, but absent in the references section, and some of their implications not included in the document. For example, Baillon's study documents the linkage between seapens (corals) and redfish larvae, and makes the case for seapen fields to be considered essential fish habitat for redfish. This potentially critical role of seapen fields for redfish is absent from Table 4.62 (overview of key groundfish species in the SEA area), and there is no mention of this linkage in Table 5.1. (fish and fish habitat potential environmental interactions).

Also, sponge grounds are among the more abundant VME indicator species in the SEA study area, but little attention is paid in Table 5.1. to the impacts of potential spills on these large grounds of filter-feeding, habitat forming species, and the spill simulations described in SEA seem to focus on either shoreline/surface impacts or highlights that spills will drift east (beyond 50°W). No attempt to assess the impact of these trajectories on VMEs is made, even though potentially damaging biogenic essential fish habitat could have serious long term impacts on ecosystem productivity.

These details seem to suggest that the “corals and sponges” section (page 180) was put together/updated without carrying through its implications into other sections of the SEA.

Furthermore, although corals and sponges have been the initial focus in the study of VMEs, many other taxa have been identified as VME indicator species, including tube-dwelling anemones, erect bryozoans, and crinoids, and several physiographic features (e.g. seamounts, canyons, the Southeast shoal) have been identified as VME elements because they contain (or are likely to contain) VMEs (NAFO 2012). These

other VME components are not really discussed in the SEA nor is an assessment of the potential impact of Oil and Gas exploration/production on them.

Many of the NAFO reports from the Scientific Council meetings since 2008, and the reports from the SC WGEAFM (and references within) summarize most of the available information on VMEs in the SEA study area. These reports should be used not just to describe what is known on VMEs, but also to inform/construct scenarios for spill simulation studies.

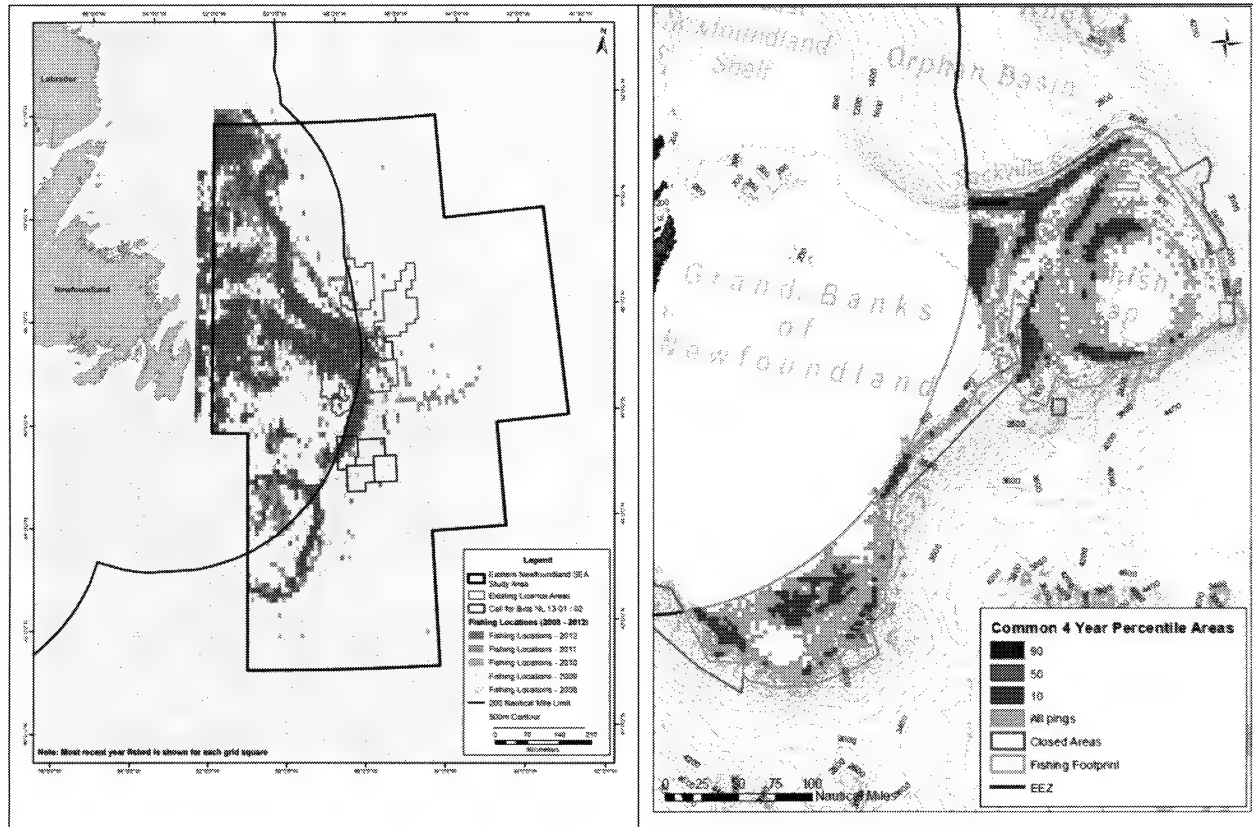
Although not yet available, the upcoming NAFO SC WGESA report (to be released in May 2014) will also contain an updated summary on VMEs, and an analysis of adequacy for current NAFO VME closures. This report will also contain recent findings that suggest that VME areas may be linked to higher fish densities, highlighting the potential importance of these areas for overall ecosystem production. Although it would have been impossible for the SEA drafting team to know these latest unpublished results when putting the SEA document together, the participation of NAFO within the Working Group could have made them aware of this ongoing work, and possibly made available some of the preliminary results for the SEA drafting team.

Another important source of information that would be useful to track for preparation of the final version of the SEA is the report of a Convention on Biological Diversity (CBD) Regional Workshop that took place in Montreal, on 24-28 March 2014 and was intended to facilitate the description of ecologically or biologically significant marine areas in the Northwest Atlantic. The international waters within the SEA study area were part of the area considered by this CBD workshop.

4. Incomplete (and potentially misleading) description of fishing activities

Virtually the entire section 4.3.4 (marine fisheries) is constructed on the basis of Canadian fisheries, or foreign fisheries which land their catches in Canadian ports. This is an incomplete and limited view of the fishing activities that take place in the SEA study area. The entire section suggests a distribution of fishing activities that completely misses the international fisheries operating outside the EEZ and managed by NAFO, and most of the maps could misled an uninformed reader to believe, for example, that there is essentially no fishing going on in the Flemish Cap, or that the Sackville Spur has no fishing whatsoever, when in reality this is one of the areas in the region that has the highest levels of fishing effort (e.g. NAFO 2012a). To permit a general visual comparison, copied below are Figure 4.122 from the SEA report (commercial fishing locations in 2008-2012) and Figure 4.2.2.1.7 from NAFO (2012a) (common fishing effort areas derived from VMS data in 2008-2011).

Fishing Locations from SEA Report	Fishing effort from NAFO (2012a)
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Explicitly, there is no attempt to imply that these omissions and shortcomings are intentional, but nonetheless they effectively render useless the entire analysis of marine fisheries. The SEA states in its page 441 that *“Although the DFO datasets are known not to be comprehensive, particularly with regard to important inshore fisheries, the information provides a useful regional picture of fishing activity in the area that is considered adequate and appropriate for the purposes of the SEA”*. Based on the comparison of the figures above, there is strong disagreement with this statement. Without integrating the information from Canadian and international fisheries it is impossible to assess if the picture provided is adequate and appropriate. The entire section should be redone incorporating the international fishing effort data. These data, in some kind of aggregated format, could be requested from the NAFO Secretariat for its inclusion and integration in the SEA.

In conclusion, the SEA document contains a large volume of information, and compiles a lot of valuable data, but it is not complete; it fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them). The document misses important and basic considerations on ecosystem structure and function, does a poor job at exploring potential impacts on ecosystem functioning, and gives a partial depiction of the fishing activities that takes place in the study area. As a strategic environmental assessment that is expected to last for a decade it falls far short

from the mark. It needs major changes/updates before it can become a reliable source of guidance for policy and management decision-making.

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- NAFO 2012b. Report of Scientific Council Meeting, 1-14 June 2012. NAFO Scientific Council Summary Document 12/19. Serial No. N 6072.
- Pepin, P., A. Cuff, M. Koen-Alonso and N. Ollerhead. 2010. Preliminary analysis for the delineation of marine ecoregions on the NL shelves. *NAFO SCR Doc.* 10/72. Serial No. N5871.

Pérez-Rodriguez A., A. Cuff, N. Ollerhead, P. Pepin, and M. Koen-Alonso. 2010. Preliminary analysis towards the delineation of marine ecoregions in the Flemish Cap, Northwest Atlantic. NAFO SCR Doc. 10/73. Serial No. N5872.

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Beazley, L. I., Kenchington E. L., Murillo, F. J., and Sacau, M. 2013. Deep-sea sponge grounds enhance diversity and abundance of epibenthic megafauna in the Northwest Atlantic. – ICES Journal of Marine Science, doi:10.1093/icesjms/fst124.

P. 39 Primary emissions from offshore production should explicitly list produced water since it is the largest waste stream.

P. 47, Table 3.4 *These numbers are not standardized per unit time or capacity; therefore, they are misleading.* What are the “lifespans” of the wells in this table – i.e., how many of the 29,527 wells in the 1980’s were also operational in the 1970’s (and hence double counted)? The total number operating during each period may reduce the apparent blowout frequency by referencing existence in more than one of the time periods. The number of operating wells in 1971-80 plus the number of “new wells” minus the number of “decommissioned wells” would be a more meaningful number in this column in this comparison. The number of exploration vs production wells would be very revealing also, in my opinion, revising the blowout instances per unit time of well operational life would be more informative than the numbers reported here.

P 49-50 Spill data for NL offshore should be updated to include 2013. Discussion should include that may be due to aging or leaky infrastructure.

P 55-58 Oils spills scenarios under ice should also be included in these tables where available. They are mentioned as part of some of the studies but not included in the tables.

P.58, Table 3.8 Subsequent comments below the table (in the text of the page) suggests that 2% is some form of benchmark for oil spill dispersion rate. What is the basis for reliance on such a number? What is the reference authority for this number and is it an ecologically useful number?

P. 82 2 Why is the explicit risk of a landslide (1/500) included here? The risks for other geohazards are not specified. This is also reported as a personal communication which is not helpful for future planning. Instead the section should be updated to include the anticipated report from NRCan with slope failure risk maps. This would provide operators with useful information at the planning stages.

P. 82 3-4 A map of the features of the Orphan Basin described in this section should be included. They are not in Figure 4.3.

There are lots of Piper pers. comm. in this section. Since this is an area of active research and since the SEA is a living document, this section should be updated on a priority basis as the research is published.

P. 102 Precipitation. These figures need a better explanation for the y-axis. Does the frequency of occurrence (%) refer to event duration per month or number of events per month or per day?

The data for frequency of thunderstorms looks odd. 4.26 has a big spike in July while 4.28 has a big dip in September. Are these real or the result of calculation errors? Since this is a 63 year climatology it should not be related to sample size and interannual variability.

P. 164 Plankton The role of plankton in nitrogen and carbon cycling is not well explained. The term "biological pump" is misused. It does not refer to benthic pelagic coupling (which is an important process and should be explained) but rather to the sequestration of biogenic carbon in the deep ocean.

P. 165 The causal mechanisms of the spring bloom are incomplete. Onset of stratification and the interaction with light availability are key factors.

P. 166 Incorrect use of the term "biological pump".

P. 168 This section is missing several important aspects of macroalgal communities. Several types of macroalgae in particular coralline algae have depth distributions well in excess of 30 m. Urchin-kelp-coralline algae dynamics are an important determinant of hard substrate communities in our waters (Himmelman & Steele, 1971). The substrate of the Grand Banks has been greatly disturbed by trawling which may affect the distribution of macroalgae. Fishing exclusion zones and artificial reefs may change this and provide refuges for macroalgae. Seaweed zonation with light is an important determinant of distribution. Seaweed communities are vulnerable to oil spills. Therefore coastal seaweed communities and their structure and function should be included in this section.

Benthic communities – general comment: Different types of benthic communities are sensitive to different types of disturbance. This should be discussed and summarized in a table for easy reference.

P. 172 Amphipod prey include much more than just seaweed and phytoplankton. They have many diverse and ecologically important feeding modes. Many are scavengers and some are aggressive predators.

P. 172 Polychaete information is not comprehensive. The available literature should be used to provide data on diet and ecological roles of these important members of the benthos.

P. 181, Table 4.61 The final column of this table is difficult to read - first the number of digits after the decimal is inconsistent and the column is center justified, both of which are inappropriate formats for displaying such data. Change to right justified and constant number of digits after the decimal; I suggest one digit past the decimal to be sufficient (occurrence is a "summary" statistic after all - the precision is unwarranted).

P. 184-196, Table 4.62 & 4.63. This table is listed alphabetically by species. This is a rather arbitrary order and makes no ecological or taxonomic sense. The order of the species in the table should be taxonomic to permit grouping of species into various logical ecological groups.

P. 189 In the past, redfish larvae dominated the ichthyoplankton in many parts of the SEA area (Serebryakov *et al.* 1987).

P. 189 The introduction of invasive species and changes to habitat and/or community structure should also be discussed in the context of cumulative effects.

P. 197, Table 4.64. The superscript #4 (for Atlantic cod) in the table has no corresponding footnote reference on the final row of the table.

P. 200, Table 4.65. Much is made in the accompanying text around this table, of the inflated representation introduced by comparing numbers among various body sizes (e.g., cod versus sand lance). I agree it is important – so much so that I suggest a Table be added as a companion to this one, which reports not numbers, but weight of catch by species reflecting the biomass of the various species in the SEA area.

P. 218-224, Section 4.2.1.7 Other than a line in one of the tables in this section of the report, there is no mention of Atlantic cod, despite the existence of a published Atlantic cod Recovery Potential Assessment in 2011 (DFO-CSAS). This omission must be rectified.

P. 227, Table 4.67. First row (green crab); this species is also one of the few AIS which are known to destroy fish habitat (i.e., eelgrass), thereby affecting recruitment of some species (e.g., Morris *et al* 2010 CSAS Res Doc).

P. 397 Table 5.1 is not adequate. This is a "summary of **some** known... **based on available sources**" is the header of column 3. It implies that the authors did not do a

thorough job of reviewing and summarizing the existing literature. The table is incomplete and often cites reviews of reviews.

P. 399 Produced water effects should include increased nutrient loading and the ecosystem consequences for benthic pelagic coupling and production (Rivkin *et al.* 2000).

The effects of drilling wastes on sensitive benthic species that cannot move away such as corals and sponges is not well understood. However, since they are filter feeders and known to be sensitive to increased sedimentation, organic matter loading and quality of suspended particulate material we can anticipate that they will be severely negatively affected. There is also very little information on the potential effects of seismic exploration on these organisms. These aspects should be highlighted as a critical information gap.

P. 400 2nd line Tannen *et al* is mis cited. The effects found relate to increased oxygen demand not oxygen enrichment. Produced water effects in this section are related to discharge not flaring. Rye *et al* 2003 is not in the list of references.

P.400-401 This section is a very poor summary of other summaries. It is not comprehensive and will not serve as a useful reference. Our understanding has changed dramatically with the research following the Macondo blowout. This should be reflected in this summary.

P. 404 This section includes mitigations for ballast water introduction of invasive species but not for fouling organisms on hulls, drilling rigs or equipment. Protocols for mitigation of these introduction vectors should also be included in this section.

P. 421 The risk from ingestion of floating debris (i.e. plastic bags) for turtles should be discussed and garbage management and on shore disposal proposed as mitigations.

Section 5.6 (p. 425) The mitigation for cumulative effects is to reduce overlap of projects. This is not realistic. Overall this section is inadequate and does not summarize or address the potential for cumulative effects. It should include interactions between activities as well as thresholds for effects and consider climate, habitat and foodweb change as possible drivers.

P. 426 This section implies that only designated VMEs and Coral Areas will be considered in this section. Other coral and sponge populations are only briefly referred to in the ecosystem overview and generally ignored in the assessment of potential effects.

There is no section on the potential effects of the environment (including other human activities) on oil and gas exploration and development.

Section 5.7 Coral and sponge effects and sensitivity should be identified as a significant information gap.

The SEA report is missing data on fish and fisheries from outside the 200 mile limit. NAFO data and reports for the area beyond 200 miles is ignored. For example, fig 6.3 is for Canadian vessels only. Campbell & Federizon (2013) provide data for fishing vessel activity in the areas governed by NAFO for 2011 and 2012. Such information should be combined with the fishing effort information from DFO to provide a complete picture of fishing in the SEA area.

P. 444 It is not clear what this note means. Does it mean that if DFO/NAFO wants to extend the closure of the coral and sponge VMEs to other human activities that CNLOPB will include this in the SEA?

References

Campbell, N. & R. Federizon, 2013. ESTIMATING FISHING EFFORT IN THE NAFO REGULATORY AREA USING VESSEL MONITORING SYSTEM DATA. NAFO SCR Doc. 13/001

Himmelman, J H; D H. Steele, 1971. Foods and predators of the green sea urchin *Strongylocentrotus droebachiensis* in Newfoundland waters. Mar. Biol 9.4 :315-322.

Rivkin, R. B., R. Tian, M. R. Anderson, and D. Deibel, 2001. Ecosystem Level Effects of Offshore Platform Discharges- Identification, Assessment and Modelling. SETAC Globe 2(2).

Serebryakov, V P; Astafjeva, A V; Aldonov, V K; Chumakov, A K 1987. USSR Ichthyoplankton investigations on Flemish Cap, 1978-83. NAFO SCI. COUNC. STUD 11: 7-21.

Specific Comments on Corals and Sponges

Fig. 1.1 It would be helpful to include major bathymetric contours/features on the map similar to Fig. 2.2. As it stands there is very little frame of reference. Also, perhaps darken contours somewhat.

P. 25 14) CAPP- assume this is correct definition? It is also the acronym for Canadian Association of Prawn Producers

Fig. 4.6. Should indicate in title or legend that bathymetry is in 'm'.

4.2.1.5 (p. 170) "Studies to date indicate that, like fish, benthic assemblages respond to environmental variables such as depth, substrate and flow field (Houston and Haedrich 1984; Schneider *et al* 1987)." Add the following references related to Grand Banks benthos: Gilkinson and Gagnon, 1991; Gilkinson, 2013; Gale *et al.* (in press):

- Gilkinson, K.D and J-M Gagnon. 1991. Substratum associations of natural populations of Iceland scallops, *Chlamys islandica* Müller 1776, on the northeastern Grand Bank of Newfoundland. *American Malacological Bulletin* 9, 59-67.
- Gilkinson, K. 2013. Recent DFO (Newfoundland & Labrador Region) studies of the Grand Banks benthos at small and large spatial scales. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/114. V + 30 p.
- Gale, K.S.P., K. Gilkinson, J-F Hamel and A. Mercier. (in press). Patterns and drivers of asteroid abundances and assemblages on the continental margin of Atlantic Canada. *Marine Ecology*.

p. 168. "... and DFO and NAFO RV surveys...

"...visual assessments also poorly... ". What is meant by 'visual assessments'?

"It is also important to note that characterizations of benthic communities are also inevitably biased according to sampling method. For example, visual assessments often poorly assess infaunal communities whereas grabs may have challenges sampling communities over harder substrates." It should also be noted that bottom trawls typically sample only a small fraction of resident benthos, most often larger epibenthos.

p. 187 "A number of research initiatives have also characterized benthic communities on the Grand Banks (Schneider *et al* 1987; Kenchington *et al* 2001)". The following should be added: Gilkinson, 2013; Gale *et al.* (in press). Gilkinson (2013) documents benthic communities over areas of Grand Bank as part of the DFO NL NEREUS Ecosystem Research Initiative, which involved a 3-year grab sampling program during multispecies trawl surveys. Gale *et al.* (in press) describe seastar (Asteroidea) assemblages and habitat use over wide areas of the eastern Canadian continental shelf and slope based on DFO survey trawl bycatch records and ROV video.

"Perhaps the most holistic sampling was done on the Grand Banks as part of a series of trawling impact studies (Prena *et al* 1999; Kenchington *et al* 2001). These researchers used video and grabs (Kenchington *et al* 2001) and a benthic sled and trawl bycatch (Prena *et al* 1999)..."

Table 4.58 Overview of Some Key Shellfish Species in the SEA Study Area

Note: some non-shellfish species are included in this table. E.g. sea urchins, polychaetes, sponges etc...

Table 4.58. Should be "Iceland" scallop not "Icelandic".

"Spat settle primarily between August and November at depths of 10-15 m. Please note they also settle in deep offshore water, primarily gravel, on Grand Bank (see Gilkinson and Gagnon, 1991).

Under the Section on 'Pale Sea urchin' and depth distribution, add Gagnon and Gilkinson (1994) reference:

Gagnon, J-M., K.D. Gilkinson. 1994. Discrimination and distribution of the sea urchins *Strongylocentrotus droebachiensis* (O.F. Müller) and *S. pallidus* (G.O. Sars) in the Northwest Atlantic. *Sarsia* 79, 1-11.

Under the Section on surf clam. Actually, surfclams (*Spisula solidissima*) are mostly confined to warmer waters, which on Grand Bank, is the Tail of the Bank and SE Shoal. The species that is harvested commercially north-east of here is the Arctic surfclam, *Mactromeris polynyma* with only sporadic occurrences of S.s. Contact Elaine Hynick, Science Branch, DFO for more detailed information.

Pertaining to the Section on Polychaete worms, it is stated that they occur on a variety of substrates. Much of Grand Bank is comprised of sandy sediments which support abundant and diverse populations (documented by Kenchington *et al.*, 2001).

"Collectively, these studies confirm that benthic communities in the SEA Study Area are quite diverse compared to higher trophic levels, as well as being somewhat sensitive to anthropogenic effects..." This statement needs qualification. When speaking in terms of sand-dominated continental shelves, the global literature on fishing impacts in these habitats indicate that, in many cases, recovery can be relatively rapid (e.g. months). However, in deep-water slope environments inhabited by slow growing, long-lived corals and sponges, recovery could be measured in terms of decades in many cases, if not longer (please include references).

P. 192. "A total of four invertebrate taxa (snow crab, northern shrimp, pink striped shrimp, and shrimp *Pandalus propinquus*) were available from the Canadian Research Vessel surveys (Table 4.60)." This needs clarification. These are the major commercial spp., however many other non-commercial taxa have been processed using standardized protocols during RV surveys since 2005/2006. The point of availability is inaccurate.

Corals and sponges - Change all Gilkinson and Edinger (2009) citations to Gilkinson and Edinger (eds.)(2009); also in references.

"Collectively, sea pens, soft corals, stony corals, and sponges are represented across the shelf, slopes and banks of the Study Area but are found at their highest densities along the slopes, i.e. depths > 200 m (Gilkinson and Edinger, eds., 2009; Wareham and Edinger, 2007; Wareham, 2010; DFO 2010; NAFO 2010; Murillo *et al* 2011).

Wareham, V.E. and E.N. Edinger. 2007. Distribution of deep-sea corals in the Newfoundland and Labrador region, Northwest Atlantic Ocean. *Bulletin of Marine Sciences* 81 (Supl. 1): 289-312.

Wareham, V.E. 2010. Identification, distribution, and conservation of deep-sea corals in Canada's Northwest Atlantic. M.Sc. thesis. Memorial University of Newfoundland. 201 pp.

"Sponges, in contrast are more widely distributed and high densities can be found along the eastern slopes of the Grand Banks, around the Flemish Cap and along the northern slopes of the SEA Area." A reference for this statement should be provided.

"In response to the known sensitivity of coral and sponge grounds, many a number of important coral and sponge areas have been designated as Vulnerable Marine Ecosystems (VMEs) (DFO 2012b) and are protected from damaging fishing activities in Canadian and NAFO waters.." It should be noted that with the exception of a portion of the SW Grand Banks slope closure, these fishing closures occur in the NAFO regulatory area outside Canadian waters.

4.2.1.10 Ecologically and Biologically Significant Areas (EBSAs). "*Southeast Shoal and Tail of the Banks*: This EBSA falls within the SEA Study Area, and has been identified due to its importance to the finfish, invertebrate, and plankton community. The Southeast Shoal has been designated primarily because of its importance as a spawning area for several commercial (American plaice, yellowtail flounder, capelin and Atlantic cod) and non-commercial (northern sand lance) fish species." It should also be noted that the SE Shoal is an area with some of the highest (if not the highest) benthic biomasses recorded anywhere in the world due to the standing biomass of populations of the Arctic wedge clam, *Mesodesma*.

Figs. 4.70, 4.71. What is the time period covered by the coral and sponge RV records? This should be stated in the figure titles.

Figure 4.89 Ecologically & Biologically Significant Areas (EBSAs). Why are EBSAs outside the Eastern Nfld. SEA boundaries included?

The work done to identify and describe additional EBSAs in the NL Shelves (DFO, 2013) area has not been incorporated into this report. The data layers for the EBSAs described within SAR 2013/048 can be provided upon request. The Orphan Spur EBSA, as well as possibly the edge of the Notre Dame Channel EBSA, overlaps with the study area. Please refer to the following reference:

DFO. 2013. Identification of Additional Ecologically and Biologically Significant Areas (EBSAs) within the Newfoundland and Labrador Shelves Bioregion. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2013/048.

Figure 4.90 Ecologically Important Areas Identified in the Orphan Basin SEA (2003). The colour designation for the Orphan Basin area should be a darker shade to differentiate from the surrounding area.

Figure 4.91 Areas of Relatively High Faunal Abundance as Identified by Canadian Research Vessel Surveys, 2005-2009 (Finfish and Invertebrates) The legend provides a

colour scheme for abundances. How were these derived? Similarly for Fig. 4.92 (biomass), and Fig. 4.93 (species richness).

Marine Mammals Section

General Comments

Given the objectives of the SEA, the document is generally well written.

Specific Comments on primarily the marine mammal text and aspects of Section 5; as well as, parts of Section 4 (Climatology, Oceanography and Ice).

1a) Perhaps most pertinent to Section 4 (physical setting text) is the lack of a comprehensive overview on climate change. This needs to be addressed. There are a few statements regarding climate change but nothing substantive. There should be general information on the most current projections relative to air and sea temperatures, currents, primary productivity and changes in frequency of extreme weather based on regional climate change models. Which models are considered best right now for the study area in question? Where are the data gaps and key uncertainties? These projections should be integrated into subsequent areas of text throughout the SEA as required (e.g. the sections on ice and ice bergs as well as in the species accounts where information is available).

Section 4.1.4.4 on Extreme Wind and Wave Events partially captures the level of integration and comprehensiveness that is required to make all the information presented useful. However, it lacks a climate change context and this is a problem.

Section 4.2.1.8 Environmental Influence and Changes does provide useful information on climate change on fish and invertebrates; however, the context needs to be improved with the addition of information of the role of the North Atlantic Oscillation (NAO) and more comprehensive text on climate change generally (either in the existing text or earlier in sections on the physical environmental setting).

1b) There are sections of text where the data sets used seemed dated – e.g. DFO fish survey data up until 2009; Sea Ice Atlas to 2010; some tropical storm data to 2000; MSC50 wave/current data to 2011 ect... It is understandable that some data sets may not be available after the said date. However, it seems likely that some are (i.e. the most recent tropical storm data would be very informative and links back to comment 1a). This needs to be clarified for the reader. If a data set is 'prematurely' truncated or not being used for some reason – it should be stated. If there are additional data, then it should be noted when they are likely to become available.

2) Section 4.2.3.3 on Pinnipeds needs to be expanded so that harps, hoods and grey seals are treated separately in the summary table (i.e. in the same manner key whale

species were addressed). Although there are similarities in the ecology of harps and hoods, there are enough differences that lumping both species together results in a summary table with content that is too general to be useful. The timing and use of ice habitat for whelping needs to be a focus for each of these two species. There is also a climate change aspect that should be presented and discussed (there is published literature on this topic as well as new information becoming available pers. comm. Garry Stenson). Note that a recent publication on satellite movements of hooded seals indicates that there is significant feeding along the shelf edge to the east of the 'Northeast Shelf Slope' EBSA. Refer to:

Andersen, J. *et al.* 2012. Habitat selection by hooded seals in the Northwest Atlantic Ocean. ICES J of Marine Science.

Note that there are likely harbour seals present along the southern shore of the Avalon Peninsula for most of the year in addition to the Bays along the south coast. Also, note that this March the Convention on Biological Diversity conducted a science advisory workshop to delineate EBSAs in the Northwest Atlantic Area beyond the 200mile limit. One area that was identified was the shelf break area from the Lilly/Carson Canyon area extending northward to 48' N.

3) The sections on Important Areas and Times for each of the key VEC species groups (e.g. Marine Mammals and Sea Turtles - 5.3.3.2) have considerable repetition from earlier sections of text. Some of this is warranted, but there should also be an effort to link this information with the appropriate mitigation measures presented in each of the preceding sections of text.

4) The section of text on Cumulative Environmental Effects 5.6 is very superficial as presented. The proponents state that this is because upcoming projects and their footprints are unknown. However, there is not even an explanation on how cumulative effects are currently being assessed nor is there acknowledgment and discussion on the advancements in cumulative effects research in recent years. These problems need to be corrected. It should be noted that this March, DFO conducted a National Science Advisory Process to develop a new framework for large project cumulative effects on marine mammals. Contact J. Lawson for details on when this information will become available. Regarding the issue of unknown projects and unknown project footprint sizes as an explanation for providing no relevant industry information - elsewhere in the document and on the C-NLOPB web site there are indications that ten EA documents are in process. At the very least, an overview and time line of these activities should be presented.

Marine Fish Species at Risk Section

General Comments

The report provides a comprehensive review of the biology, ecology, distribution and general aspects of the life history of several relevant fish species inhabiting the Grand Bank and southern Labrador shelf. In general the data shown in the Figures and Tables are accurate and informative, and the references cited in the report are generally up to date, with a few exceptions, notably the lack of the most recent publications describing feeding habits and distribution and abundance trends of the three wolffish species found in the study area. Another interesting aspect of this report is the integrated approach used to describe fish habitat and how it varied temporally and spatially, including the interrelationships of the various trophic/ecological components.

With regards to environmental interactions, mitigation and planning considerations, the report presents a comprehensive description of possible interrelationships resulting from potential offshore oil and gas activities on the Grand Bank and adjacent areas (as summarized in Table 5.1). The report lists the major activities related to seismic surveys, exploration, drilling and production activities, and how these activities might potentially impact fish and fish habitat, while considering results from previous studies and other sources of available information. However, some of the 'Environmental Mitigation Measures' as stated in the report are vague. For example, the report suggests as a mitigation procedure 'avoiding species at risk where possible during the planning and conduction of oil and gas activities in the offshore'; the three wolffish species are found throughout the study area, therefore no practical avoidance exists. What should be a practical mitigation measure in the case of wolffish or white sharks? Moreover, there are no considerations regarding accidental oil spills vis-à-vis fish species at risk and their habitat. This study includes the spatial distribution of abundance indices for the three wolffish species; and potential spatial and temporal trajectories of oil spills have been modelled/simulated in previous studies (e.g. Net Environmental Benefit Analysis of Dispersant Use for Responding to Oil Spills from Oil and Gas Facilities on the Newfoundland Grand Banks, 2013); both sources of information could be used to assess the impact of oil spills on the wolffish populations components found in the study area and could also be used as a framework for identifying appropriate mitigation measures in the case of oil spills.

In addition, acronyms for legislation (e.g. SARA) should not be italicized. And "striped wolffish" and "Atlantic Wolffish" are used interchangeably whereas it would be useful to be consistent.

Specific Comments

P. 185. Atlantic wolffish. Add references:

Simpson et al. 2013 (Simpson, M.R., Sherwood, G.D., Mello, L.G.S. Miri, C.M., and Kulka, D.W. 2013. Feeding habits and trophic niche differentiation in three species of wolffish (*Anarhichas* sp.) inhabiting Newfoundland and Labrador waters. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/056. v + 29 p.).

Collins et al. 2014 (Collins, R.K., Simpson, M.R., Miri, C.M., Mello, L.G.S., Hedges, K, Chabot, D., Benoît, H., McIntyre, T.M. 2014. Assessment of Northern Wolffish, Spotted Wolffish, and Atlantic Wolffish in the Atlantic and Arctic Oceans. DFO Can. Sci. Advis. Sec. Res. Doc. 2014/034.).

(Add the same references for Northern Wolffish (Page 188) and Spotted Wolffish (Page 191).)

P. 185 Atlantic Wolffish Habitat and Distribution section – wolffish are found over a variety of substrates (not just “hard clay bottom”), and at depths less than 25 m, and in excess of 250 m.

P. 185 Atlantic Wolffish Use and Importance – the fact that this species can be retained under SARA, unlike the other two, deserves mention, even if this species is not “commercially significant”

P. 186 Cusk Biology and Ecology Section – fish species are an important component of the Cusk diet (Bowman *et al.* 2000)

P. 186 Cusk Use and Importance Section – worth mentioning that Cusk is monotypic species in NW Atlantic

P. 188 Northern Wolffish Habitat and Distribution Section – “occurs in Arctic seas on both sides of the North Atlantic Ocean” should be rewritten. It occurs in both Arctic and Atlantic Oceans. So do other wolffish species, though no mention of this is made. The fact that it is more pelagic than the other two species should also be noted.

P. 188 Comment: It is stated on Table 4.62 that Northern Wolffish is distributed as a ‘widespread self-assemblage’, whereas in fact Northern Wolffish are mostly found along the shelf edge, not on the shelf.

P. 190 Roughhead Grenadier Habitat and Distribution Section – Lorange *et al.* (2008) is relevant to the Northeast Atlantic, only. A publication by Edinger *et al.* (2007) contains information on this species in NL waters. Specifically, it reports that Roughhead Grenadier were found in association with deep-sea corals, such as gorgonians, antipatharians, and soft corals, at depths of 200-1000 m.

P. 190 Roundnose Grenadier Habitat and Distribution Section – Lorange *et al.* (2008) is relevant to the Northeast Atlantic, only. In the NW Atlantic, the species has been caught at depths less than 400 m. The data provided for NL comes from Parsons 1976. Newer information is available, in Power and Maddock Parsons (1998) and Kulka (2001). Most catches of this species occurred at depths of 900 m or more.

P. 190 Spotted Wolffish Biology and Ecology Section – spawning in late autumn and early winter was suggested by Templeman 1966. A more recent publication (Templeman 1986) suggested mid to late summer spawning (July-August-Sept).

P. 191 White Hake Habitat and Distribution section – white hake occur at depths much less than 200 m. On the western St. Pierre Bank, and southwest slope of the Grand Bank, they frequently occur at around 100 m (Han and Kulka 2007). Juvenile White Hake are commonly found inshore, and may even occupy estuaries. Why the reference to Longfin Hake (*U. chesteri*)?

P. 191 White Hake Biology and Ecology section – not all juveniles are pelagic. The juvenile stage of the life cycle is characterized by pelagic and (later) demersal components.

P. 192 Winter Skate Biology and Ecology section – Kelly and Hanson (2013) estimated that 40-70 egg cases are deposited each year. Also, cephalopods (squid) are an important component of the diet.

P. 195 Comment: It is stated that Capelin spawning sites are known to occur in offshore areas (the example used was the Southeast Shoal in NAFO Div. 3O). To my knowledge no offshore spawning site has been identified, but inferences about it have been postulated based on the observation of mature capelin found in the offshore, as well the presence of larvae and early life stages.

P. 196 Shortfin Mako Biology and Ecology section – cephalopods are a major component of the diet.

P. 196 White Shark Biology and Ecology section – White Sharks reproduce via internal fertilization, and development is characterized by aplacental viviparity (also known as ovoviviparity) with embryonic oophagy. See Saïdi *et al.* 2005.

P. 199 last paragraph. The word 'represent' is misspelled.

P. 220 last sentence. 'American long line fishery' American Plaice?

P. 233-235. No units are shown in Figures 4.91 through 4.93.

P. 396 last bullet. Comment: This sentence is vague, direct mortality of marine organisms (at various stages of development) resulting from exposure to oil pills should be stated explicitly here.

Pelagic Section

Specific Comments on Capelin

P. 195 -capelin also spawn on the bottom in coastal waters.

-capelin found in 3NLOPs in spring RV survey. Include 3K and 2J from fall RV survey. Besides the RV trawl surveys, capelin distribution information is available from annual DFO acoustic surveys.

P. 197 -Table 4.54 spawning on Southeast Shoal takes place in June, July.

-if Table 4.54 is meant to include spawning time on beaches and coastal bottom sites and the Southeast Shoal then spawning encompasses May, June, July, August

P. 198 -the information related to 'subsequently spent adults...' is incorrect and wrongly cited. Spent females move out to deeper water after spawning on beaches/bottom sites. Those that survive eventually migrate to offshore feeding areas and likely aggregate with capelin that will be maturing and spawning next year. The timing, the route, and the mechanisms used to migrate from coastal waters to offshore feeding areas has not been documented as far as I am aware.

P. 400 - in Table 5.1, accidental spills of oils or other substances onto the Southeast Shoal during the period capelin are spawning, eggs are incubating, and yolk sac larvae are in the sediment could have a negative impact on that year class and subsequent spawning biomass and this risk should be recognized.

P. 406 - indicates Southeast Shoal is the nursery for yellowtail flounder. It should also be acknowledged that the Southeast Shoal is the only spawning site for the Southeast Shoal capelin stock.

Specific Comment on Herring

P. 193 – Herring occurrence has been recorded up to 450 m in multispecies surveys.

Specific Comments on Sandlance

Spawning season is winter (Dec-March) not June –Aug as indicated in Table 4.64.

P. 200, text says sandlance constitute 6% of RV catch and text says they constitute 30%

P. 200 – should insert information re habitat usage burrowing in substrate part of day, migrating vertically to feed. No distance migrations as are closely associated with habitat.

P. 200 – Inshore and Offshore sandlance are two different species. This should be noted as should which species is impacted by the proposed work.

Should you require any additional information on the above review please contact Dale Richards (Dale.E.Richards@dfo-mpo.gc.ca), Regional Centre for Science Advice, at 772-8892.

B. McCallum
Regional Director, Science

cc D. Sooley
 R. Anderson
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 N. Wells
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No information has been removed or severed from this page

Mansour, Atef A H

From: Templeman, Nadine
Sent: April-14-14 12:46 PM
To: Anderson, M. Robin; Gregory, Robert; Koen-Alonso, Mariano; Wells, Nadine; Gilkinson, Kent; Sjare, Becky; Bourne, Christina M; Mowbray, Fran; Simpson, Mark R
Cc: Templeman, Nadine; Richards, Dale E; Mansour, Atef A H
Subject: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review
Importance: High

Good day everyone,

Please note, as you may have anticipated, the feedback from the Science review of the Draft Eastern Newfoundland Strategic Environmental Assessment (SEA) is now being moved over to a formal Science Response Process. Also note that I will be taking over this file from Dale from this point on.

This last minute change in approach is in light of a short (although much needed) extension granted to Science Branch by the CNLOPB late last week in order for DFO to collate significant feedback received from its review. As it was Science Branch original desire to undertake a formal process for communicating the feedback from this review, we have decided that the extra couple of days will now allow us the time needed to convert the collated response from its original Memo format to draft a Science Response as the vehicle to communicate Science review/feedback. This advice will now be accessible to the public via the CSAS website upon completion. This is important given the significant feedback you all provided.

Due to tight timelines, I am proposing the use of email as opposed to a face to face meeting to review the draft Science Response. Please review the draft Science Response attached, noting whether your views were incorporated appropriately, and the whether you are comfortable with the conclusions provided. Feedback will be appreciated via email and/or tracked changes at your earliest convenience to the deadline of **12 NOON, Wednesday, April 16**. Albeit short, this deadline will allow time to determine if there are any significant issues that need to be addressed prior to finalizing the Science Response for RDS approval and subsequent submission to FPP on the agreed-upon deadline of Thursday, April 17.

Any questions, please email for the time being (or come see me) as I have moved into what was Krystine's old office and am currently without a phone line.

Thanks again, and cheers,



CSAS SRR
2014_nnn Easter...

Nadine.

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From: Richards, Dale E

Sent: March 7, 2014 3:40 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason; Sooley, Darrin; Wells, Nadine; Nakashima, Brian; Hamoutene, Dounia

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments April 2, 2014

Importance: High

Good afternoon,

Following several delays, the 'Draft' Eastern Newfoundland SEA has finally been posted on the CLNOPB website. It can be accessed at the following link: <http://www.cnlopb.nl.ca/enlsea.shtml>. The full SEA document along with the associated SEA appendices have also been posted on the shared Science drive under the Science folder: Science Info/CSA Review/ Habitat/ SEA & EA/ Eastern NL SEA March 2014 request. Please note that I have not removed the 'Eastern NL SEA December 2013' files from the shared folder by chance that someone wishes to compare the two draft versions. However, if you have not commenced your review please be sure to use to the most recent version of these SEA files.

To date I have received a few submissions pertaining to this request and this content will be included in the Science response memo. To those Sections that still intend on sending along comments or additional revisions the CSA Office will require such submissions by **April 2nd**.

Listed below are specific Sections of the EA Report which require Science review:

Environmental Setting

- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Sensitive and Special Areas (note revised title)
-

Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
- Section 5.3 – Marine Mammals and Sea Turtles (including Species at Risk and Other Key Species)
- Section 5.4 – Sensitive and Special Areas (note revised title)

Please give me a call if you have any questions on this process.

Thank you,
Dale

From: Richards, Dale E

Sent: January 31, 2014 1:47 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

Good afternoon,

There has been a further delay in the submission of the Eastern Newfoundland SEA for review. The latest I have received from the FPP (via the CLNOPB) is that the 'final' draft report will be made available to us for review the end of February. I will continue to keep you updated as CSA receives any information.

Dale

From: Richards, Dale E

Sent: January 7, 2014 12:59 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

The CLNOPB has advised that the submission of the 'final' draft report - Eastern Newfoundland SEA - to FPP will be delayed until the end of January. This 'final' draft will be an update to the 'preliminary' Draft #1 version highlighted in the e-mail below and posted on the Science shared drive prior to the Christmas break. Based on this information, we know that an extension on this request for advice will be forthcoming. Thus, it may be advisable to delay your review of the preliminary draft of the SEA report until the final draft becomes available.

As soon as the CSA Unit receives an update from FPP, I will send out a revised deadline to this request. At this point, a 3-week delay to obtain the 'final' draft SEA is anticipated.

Please give me a call if you have any questions on this process.

Thank you,
Dale

From: Richards, Dale E

Sent: December 23, 2013 4:56 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comments January 20, 2014

Good afternoon,

In consultation with the RDS-Office, the CSA Unit has decided that based on the timing of this request and the draft nature of the Eastern Newfoundland SEA report that this request for advice will be provided to Ecosystems Management via a memo. i.e. there will be no formal Science meeting or SSRP process at this time. To that end, comments on the SEA report will be needed by the CSA office by **Monday, January 20th**. This will allow the CSA Unit a few days to compile the comments.

Section heads, please ensure that this request and deadline is sent to the appropriate scientist within your section. For your reference, the original e-mail is provided below.

If you have any questions, please let me know.

Thank you,
Dale

From: Richards, Dale E

Sent: December 2, 2013 2:19 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry

Subject: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comment mid-January 2014 - Please action

Good afternoon,

CSA has received, from the FPP (via the C-NLOPB) for review, the Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1.

DFO is providing expert advice, to support the C-NLOPB, on baseline conditions (i.e. environmental setting) and mitigations related to potential impacts of oil and gas activities on fish, fish resources, SAR, sensitive areas and DFO research activities.

To provide context related to the SEA process please see Section 2: SEA - Scope and Approach.

The Science review should focus on whether the baseline information is accurate and that the effects assessment, taking into consideration departmental guidance such as the "Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment"

Listed below are specific Sections of the EA Report which require Science review and comments:

Environmental Setting

- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Protected and Other Designated Sensitive Areas
-

Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
- Section 5.3 – Marine Mammals and Sea Turtles (including Species at Risk and Other Key Species)
- Section 5.4 – Sensitive Areas

The FPP has requested that Science provide comments by the end of January. In the interim, until a Branch decision has been made on how this request for advice is going to be handled (i.e. memo or SSRP process), I have placed the SEA report on the shared drive in the '**CSA Review**' folder, subfolder ' **Eastern Newfoundland SEA - December 2013 Request**'. This will allow the maximum time available to Science to review and provide comment on the report. Whether a SSRP process takes place or a memo is formulated, I suspect that comments will be required from individual scientists by **mid-January 2014**. I will be in touch at a later date regarding specific deadlines and what format this request for advice will take.

As always, if you have any questions please let me know. Section heads, please ensure that this request is sent to the appropriate scientist within your section.

Thank you,
Dale

E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

Newfoundland and Labrador Region / La Région de Terre-Neuve et du Labrador

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Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO

<http://www.dfo-mpo.gc.ca/csas-sccs/>

SCIENCE REVIEW OF THE EASTERN NEWFOUNDLAND STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

Context

Since 2002, the C-NLOPB has been conducting Strategic Environmental Assessments (SEAs) of portions of the Newfoundland and Labrador Offshore Area that may have the potential for offshore oil and gas exploration activity. SEA is a broad-based approach to environmental assessment that examines the environmental effects which may be associated with a plan, program or policy proposal and that allows for the incorporation of environmental considerations at the earliest stages of program planning. SEA typically involves a broader-scale environmental assessment (EA) that considers the larger ecological setting, rather than a project-specific environmental assessment that focuses on site-specific issues with defined boundaries. Notably, the accuracy of information in a SEA is especially important as it sets the basis for future project-specific EA within its study area.

On March 5, 2014, The Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) released the Draft Eastern Newfoundland Strategic Environmental Assessment (SEA) Report for public comment.

The Environmental Assessment and Major Projects (EAMP) Division of the DFO Ecosystems Management Branch in the Newfoundland and Labrador Region requested that DFO Science undertake a review of this document, and specifically the information put forward in the SEA on the (physical and biological) Environmental Setting: Section 4.1.4 (Oceanography); Section 4.1.5 (Ice conditions); Section 4.2.1 (Fish and Fish Habitat); Section 4.2.3 (Marine Mammals and Sea Turtles); Section 4.2.4 (Sensitive and Special Areas); as well as that on Environmental Interactions, Mitigation and Planning Considerations (i.e., the effects assessment): Section 5.1 (Fish and Fish Habitat); Section 5.3 (Marine Mammals and Sea Turtles); and Section 5.4 (Sensitive and Special Areas).

Given the short timeline to carry out a review, a DFO Science Response process was undertaken. Science expertise within Fisheries and Oceans, Newfoundland and Labrador Region was solicited to address this review – although the provision of feedback was limited to the areas of the report where expertise was available at the time of the review, including that from Ecological Sciences, Marine Mammals, Marine Fish Species at Risk and Pelagic Sections.

The review found that overall the quality of scientific information presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the final document can be considered a reliable source of guidance for policy and management decision-making.

This Science Response Report results from the April 2014 Science Response Process of for the DFO Science review of the *“Eastern Newfoundland Strategic Environmental Assessment (SEA) (AMEC November 2013).”* The report is a summarization of the comments provided by DFO Science Branch, Newfoundland and Labrador Region, to the Marine Habitat Protection Section on the above noted sections, as well as other parts of the document with appropriate linkages to those.

Analysis and Response

General Comments

- As the *Eastern Newfoundland Strategic Environmental Assessment* is intended to identify and incorporate environmental considerations at the earliest stages of planning and decision making, it is expected to be broad in its scope, and relatively general in its description of potential impacts associated with oil and gas exploration and/or production in the region within the next decade. However, specific details still remain important in many regards as it is fundamental that the SEA provides a complete and comprehensive system-wide perspective in order to be useful for future project-specific EAs.
- Much of the information describing the existing environment is reasonably complete for the area of the SEA that falls inside the 200 mile limit. However, specific information for the offshore (>200 miles) portion of the study area, and in particular the Flemish Cap and Orphan Basin, is lacking. This is largely attributable to lack of consideration of fishing and research data from NAFO sources and is considered a major weakness in the accuracy of the assessment.
- The SEA is lacking a comprehensive overview on climate change in its description of the physical environment. Only a few statements regarding climate change exist throughout, with nothing substantive reported. Information taken from existing models and the most current projections should be presented for key physical indices where available.
- The SEA does not adequately capture the complexity of the biological environment of the study area. The report does not describe functional ecosystem units or attempt to analyze impacts on their structure and function; but rather simply provides a list of components and compiles potential effects on them, as opposed to on the system as a whole. While this type of description is useful, it is not complete, and carries the risk of promoting “tunnel vision” approaches to management issues.
- The SEA is lacking in its consideration of important aspects of the ecosystem such as trophic structure, ecoregion configuration, linkages between the Grand Bank and the northern Newfoundland shelf, and bottom up regulation of ecosystem productivity – all of which are key to understanding the existing environment and potential interactions.
- The SEA provides incomplete descriptions of Vulnerable Marine Ecosystems (VMEs), and is lacking adequate information for characterization of VME indicator species, including their distribution and the potential impacts of oil and gas exploration/production and spills on these.
- The SEA consideration of potential environmental effects is basic at best, failing to synthesize the current understanding of potential effects. This is also the case for the sections on interactions with other human activities including fishing and sensitive and special areas. The potential for cumulative effects is mentioned in the report, but is not developed.
- The SEA contains data sets that appear to be dated (e.g., DFO fish survey data up to 2009; Sea Ice Atlas to 2010; some tropical storm data to 2000; MSC50 wave/current data to 2011; etc.) While it is understandable that some data sets may not be available after a certain date; it is, however, likely that some are available in an updated format (e.g., the most recent tropical storm data). As such, if a data set is ‘prematurely’ truncated or not being used for some reason – it should be stated as clarification within the report. Also, if there are additional data expected, it should be noted when they are likely to become available.

Specific Comments

Section 3.2 – Generic Description of Offshore Oil and Gas Activities

- Primary emissions from offshore production should explicitly list produced water since it is the largest waste stream from that activity.
- Spill data for NL offshore should be updated to include 2013. Spill discussion should also include that spills may be due to aging or leaky infrastructure.
- Oils spills scenarios under ice should be included in tables where available. Although they are mentioned as part of some of the studies, inclusion in the tables would prove useful.
- Table 3.4 – Numbers are not standardized per unit time or capacity; therefore, they are misleading. What are the “lifespans” of the wells in this table – i.e., how many of the 29,527 wells in the 1980’s were also operational in the 1970’s (and hence double counted)? The total number operating during each period may reduce the apparent blowout frequency by referencing existence in more than one of the time periods. The number of operating wells in 1971-80 plus the number of “new wells” minus the number of “decommissioned wells” would be a more meaningful number in this column in this comparison. The number of exploration vs. production wells would be very revealing also. It is suggested that revising the blowout instances per unit time of well operational life would be more informative than the numbers currently reported.
- Table 3.8 – Comments in the text related to the table suggests that 2% is some form of benchmark for oil spill dispersion rate. It is not clear what is the basis for reliance on such a number, what the reference authority for this number is, and whether it is an ecologically useful number.

Section 4.1 – Physical Environment

It is notable that the description of the physical environment lacks a comprehensive overview on climate change. While there are a few statements regarding climate change, nothing substantive is reported. This needs to be included in the SEA. In this, the document should include general information on the most current projections relative to air and sea temperatures, currents, primary productivity and changes in frequency of extreme weather based on regional climate change models. This would include consideration of which models are considered best right now for the study area in question; and data gaps and key uncertainties. These projections should be also be integrated into subsequent areas of text throughout the SEA as required (e.g. the sections on ice and ice bergs as well as in the species accounts where information is available).

Section 4.1.1 – Geology

- Note that multiple references for Piper (pers. comm.) exist in this section. Since this is an area of active research, and since the SEA is a living document, this section should be updated on a priority basis as the research is published.
- The explicit risk of a landslide (1/500) is included in the SEA, yet the risks for other geohazards are not specified. This is also reported as a personal communication which may not be particularly useful for future planning. This section should be updated to include the anticipated report from Natural Resources Canada that contains slope failure risk maps. This would provide operators with useful information at the planning stages.
- A map of the features of the Orphan Basin described in this section should be included. They are not in Figure 4.3.

Section 4.1.2 – Bathymetry

- As knowledge of bathymetry is important to understanding many key aspects of the physical and biological environment, it would be helpful to include major bathymetric contours/features in a clear manner on all maps depicted within the report (e.g., Figure 1.1), similar to that in Figure 2.2. Otherwise, maps provide very little frame of reference.
- Figure 4.6 – The figure should indicate in title or legend that bathymetry is in ‘m’.

Section 4.1.3 – Climatology

- Precipitation figures need a better explanation for the y-axis indicating whether the frequency of occurrence (%) refers to event duration per month or number of events per month or per day.
- The data for frequency of thunderstorms looks odd. Figure 4.26 shows a big spike in July while Figure 4.28 has a big dip in September. Could these be the result of calculation errors? Since this is a 63-year climatology it should not be related to sample size and interannual variability.

Section 4.1.4 – Oceanography

- The description on extreme wind and wave events partially captures the level of integration and comprehensiveness that is required to make all the information presented useful. However, it is problematic in that it lacks a climate change context.

Section 4.2 – Biological Environment (4.2.1 Fish and Fish Habitat)

A poor description of the ecosystem structure in the study area exists in the SEA. The SEA study area actually expands over at least four different functional ecosystem production units: a) the Grand Bank, b) the Newfoundland-Labrador Shelf, both of them part of the Newfoundland-Labrador Shelves marine ecosystem, c) the Flemish Cap, which is considered a relatively closed marine ecosystem, and d) the oceanic waters beyond the continental shelf break. Furthermore, it includes the transition areas between these ecosystems, and given the large range in depths involved in SEA study area, it can also be argued that it expands over bathypelagic and abyssal oceanic ecosystems. These very basic descriptions, and their potential implications, are currently absent, and need to be incorporated in the SEA.

It should be noted that the basic ecoregion structure in the Grand Bank indicates that the Grand Bank and the Labrador-Newfoundland Shelf can be considered ecosystem sub-units, where the northern Grand Bank (NAFO Division 3L) acts as a transition zone between these subunits. It is also clear the existence of a distinct shelf-break ecoregion, which acts as a transition zone (ecotone) between shelf and oceanic realms (Pepin *et al.* 2010, NAFO 2010b, 2012a). The Flemish Cap also emerges as a distinct ecosystem production unit (Perez-Rodriguez *et al.* 2010, NAFO 2010b), and both the Grand Bank and Flemish Cap are being considered candidate ecosystem management units for the development of ecosystem approaches to fisheries by NAFO (NAFO 2010b).

Although the Newfoundland-Labrador Shelves and Flemish Cap have experienced collapses of major groundfish components, and share many of their core species, the structure of these ecosystems is not identical. For example, the key forage species in the [southern] Grand Bank are sandlance and capelin, shrimp and capelin in the [northern] Newfoundland-Labrador Shelf, while in the Flemish Cap redfish and shrimp have been key prey species for that ecosystem (NAFO 2010b, 2011, 2012, Perez-Rodriguez *et al.* 2011, 2012). Furthermore, in the NL shelves, there is evidence of bottom-up regulation of capelin, its overall core forage fish species, with linkages between environmental drivers (e.g. ice dynamics), phytoplankton blooms, zooplankton

abundance, and capelin dynamics (DFO 2012, Buren *et al.* 2014), and where the dynamics of upper trophic levels (e.g. Atlantic cod) seem to have been driven by availability of food (capelin) and fishing (DFO 2012, Buren *et al.*, submitted). The influence of ice dynamics on ecosystem trends is not observed in the Flemish Cap (NAFO 2011), where besides the impact of fishing, environmental drivers seem to be influencing recruitment success, while predation by top predators appears to regulate the dynamics of juvenile and smaller fishes (Perez-Rodriguez *et al.* 2013), and where strong trophic interactions are linking the core species (cod, redfish and shrimp) in the Flemish Cap ecosystem (NAFO 2011, 2012a).

The above highlights that while the basic ecosystem organization and dynamics that exists in the SEA study area is not described by the SEA document, there are analyses and information available to produce the strategic/broad base description that could provide managers/decision makers with a more functional and holistic perspective of the ecosystems that are potentially affected by oil and gas development.

Section 4.2.1 – Fish and Fish Habitat

- The report provides a comprehensive review of the biology, ecology, distribution and general aspects of the life history of several relevant fish species inhabiting the Grand Bank and southern Labrador shelf. In general the data shown in the Figures and Tables are accurate and informative, and the references cited in the report are generally up to date, with a few exceptions. An interesting aspect of this report is the integrated approach used to describe fish habitat and how it varied temporally and spatially, including the interrelationships of the various trophic/ecological components.
- The SEA contains only partial survey information and exhibits a lack of understanding of the limitations of the DFO trawl surveys. It is notable that the SEA only considers research survey information from DFO, but survey programs conducted by the European Union (EU), and/or some of its member states, exist. These research surveys, focused on the Flemish Cap, but also on the nose and tail of the Grand Bank, are routinely used by NAFO Scientific Council to assess fish stocks in the area, as well as ecosystem structure and interactions. Numerous NAFO documents and papers describe and analyze data from these surveys (e.g. NAFO 2010a, 2010b, 2011, 2012a, Perez-Rodriguez *et al.* 2011, 2012, Nogueira *et al.* 2013).
- While the SEA mentions the changes in areal coverage and gear in the DFO surveys referenced (page 161), it also indicates that 4 invertebrate species had passed its screening process – failing to recognize that only shrimp and crab have been consistently recorded in DFO surveys since the switch to the Campelen gear in 1995-1996. As such, it is actually impossible to establish if other invertebrates (e.g. brittle stars and/or sea urchins, among others) could have met or not the SEA screening criteria. It should be noted, however, that consistency in the recording of invertebrates in DFO surveys has been improved in recent years, and as part of the DFO Ecosystem Research Initiative (ERI) NEREUS Program during 2007-2010, a grab sampling program was implemented in soft bottoms of the Grand Bank (e.g. DFO 2012, Gilkinson 2012). These results should be included in the SEA.
- An incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species exists in the SEA. Over the last 5-7 years, there has been increased research effort devoted to the identification, characterization, and mapping of Vulnerable Marine Ecosystem (VME) indicator species within the SEA study area. Most of this work has been done under the umbrella of NAFO, and through the NAFO Scientific Council (SC) Working Group on Ecosystem Approaches to Fisheries Management (WGEAFM; recently been renamed SC Working Group on Ecosystem Science and Assessment (WGESA)). Most of this work is not included or mentioned in the current SEA. Furthermore, some recent and

relevant studies like Baillon *et al* (2012) and Beazley *et al* (2013) are referenced in the text, but absent in the references section, and some of their implications not included in the document. For example, Baillon's study documents the linkage between seapens (corals) and redfish larvae, and makes the case for seapen fields to be considered essential fish habitat for redfish. This potentially critical role of seapen fields for redfish is absent from Table 4.62 (overview of key groundfish species in the SEA area), and there is no mention of this linkage in Table 5.1. (fish and fish habitat potential environmental interactions).

- It should be noted that sponge grounds are among the more abundant VME indicator species in the SEA study area, but little attention is paid in Table 5.1. to the impacts of potential spills on these large grounds of filter-feeding, habitat forming species; and the spill simulations described in SEA seem to focus on either shoreline/surface impacts or highlights that spills will drift east (beyond 50°W). No attempt to assess the impact of these trajectories on VMEs exists in the current SEA, even though potentially damaging biogenic essential fish habitat could have serious long term impacts on ecosystem productivity.
- Although corals and sponges have been the initial focus in the study of VMEs, many other taxa have been identified as VME indicator species, including tube-dwelling anemones, erect bryozoans, and crinoids, and several physiographic features (e.g. seamounts, canyons, the Southeast shoal) have been identified as VME elements because they contain (or are likely to contain) VMEs (NAFO 2012). These other VME components are not discussed in any detail in the SEA, nor is an assessment of the potential impact of oil and gas exploration/production on them considered.
- Many of the NAFO reports from the Scientific Council meetings since 2008, and the reports from the SC WGEAFM (and references within) summarize most of the available information on VMEs in the SEA study area. These reports should be used not just to describe what is known on VMEs, but also to inform/construct scenarios for spill simulation studies.
- Although not yet available, the upcoming NAFO SC WGESA report (to be released in May 2014) will also contain an updated summary on VMEs, and an analysis of adequacy for current NAFO VME closures. This report will also contain recent findings that suggest that VME areas may be linked to higher fish densities, highlighting the potential importance of these areas for overall ecosystem production. Although it would have been impossible for the SEA drafting team to know these latest unpublished results when putting the SEA document together, the participation of NAFO within the Working Group could have made them aware of this ongoing work, and possibly made available some of the preliminary results for the SEA drafting team.
- Another important source of information that would be useful for preparation of the final version of the SEA is the report of a Convention on Biological Diversity (CBD) Regional Workshop that took place in Montreal, on 24-28 March 2014 and was intended to facilitate the description of ecologically or biologically significant marine areas in the Northwest Atlantic. The international waters within the SEA study area were part of the area considered by this CBD workshop.

Section 4.2.1.3 – Plankton

- Plankton – The role of plankton in nitrogen and carbon cycling is not well explained. The term “biological pump” is misused. It does not refer to benthic pelagic coupling (which is an important process and should be explained) but rather to the sequestration of biogenic carbon in the deep ocean.

- The causal mechanisms of the spring bloom are incomplete. Onset of stratification and the interaction with light availability are key factors. Incorrect use of the term “biological pump” occurs in this section.

Section 4.2.1.4 – Plants and Microalgae

- Several important aspects of macroalgal communities are missing from the SEA. Several types of macroalgae, in particular coralline algae, have depth distributions well in excess of 30 m. Urchin-kelp-coralline algae dynamics are an important determinant of hard substrate communities in our waters (Himmelman and Steele, 1971). The substrate of the Grand Banks has been greatly disturbed by trawling which may affect the distribution of macroalgae. Fishing exclusion zones and artificial reefs may change this and provide refuges for macroalgae. Seaweed zonation with light is an important determinant of distribution. Seaweed communities are vulnerable to oil spills. Therefore coastal seaweed communities and their structure and function should be included in this section.

Section 4.2.1.5 – Benthic Communities

- All Gilkinson and Edinger (2009) citations should be Gilkinson and Edinger (eds.) (2009).
- As different types of benthic communities are sensitive to different types of disturbance, this should be discussed and summarized in a table for easy reference and decision-making.
- Regarding the statement, “...and DFO and NAFO RV surveys...” “...visual assessments also poorly...” What is meant by ‘visual assessments’ here?
- Regarding the statement, “*It is also important to note that characterizations of benthic communities are also inevitably biased according to sampling method. For example, visual assessments often poorly assess infaunal communities whereas grabs may have challenges sampling communities over harder substrates.*” It should also be noted that bottom trawls typically sample only a small fraction of resident benthos, most often larger epibenthos.
- The statement, “*Collectively, these studies confirm that benthic communities in the SEA Study Area are quite diverse compared to higher trophic levels, as well as being somewhat sensitive to anthropogenic effects...*”, requires qualification. When speaking in terms of sand-dominated continental shelves, the global literature on fishing impacts in these habitats indicate that, in many cases, recovery can be relatively rapid (e.g. months). However, in deep-water slope environments inhabited by slow growing, long-lived corals and sponges, recovery could be measured in terms of decades in many cases, if not longer (Gilkinson and Edinger (eds.)(2009)).
- Further to the statement, “Perhaps the most holistic sampling was done on the Grand Banks as part of a series of trawling impact studies (Prena *et al* 1999; Kenchington *et al* 2001), it should be noted that these researchers used video and grabs (Kenchington *et al* 2001) and a benthic sled and trawl bycatch (Prena *et al* 1999)...”
- Table 4.58 – Some non-shellfish species (e.g., sea urchins, polychaetes, sponges etc.) are included in this table summarizing shellfish species.
- Table 4.58 – Regarding the statement, “*Spat settle primarily between August and November at depths of 10-15 m.*”, it should be noted that they also settle in deep offshore water, primarily gravel, on Grand Bank (Gilkinson and Gagnon, 1991).
- Table 4.58 – Information on ‘Pale Sea urchin’ should reference Gagnon and Gilkinson (1994).

- Table 4.58 – Information on ‘surf clam’ is incorrect. Surfclams (*Spisula solidissima*) are mostly confined to warmer waters, which on Grand Bank, is the Tail of the Bank and Southeast Shoal. The species that is harvested commercially north-east of this area is the Arctic surfclam, *Mactromeris polynyma*, with only sporadic occurrences of *S. solidissima*. Contact Elaine Hynick, Science Branch, DFO for more detailed information.
- Table 4.58 – Information on Polychaete worms, states that they occur on a variety of substrates. However, much of Grand Bank is comprised of sandy sediments which support abundant and diverse populations (documented by Kenchington *et al.*, 2001).
- The statement, “Studies to date indicate that, like fish, benthic assemblages respond to environmental variables such as depth, substrate and flow field (Houston and Haedrich 1984; Schneider *et al.* 1987).”, requires addition of the following references related to Grand Banks benthos: Gilkinson and Gagnon, 1991; Gilkinson, 2013; Gale *et al.* (in press).
- Amphipod prey includes much more than just seaweed and phytoplankton. They have many diverse and ecologically important feeding modes. Many are scavengers and some are aggressive predators.
- Polychaete information is not comprehensive. The available literature should be used to provide data on diet and ecological roles of these important members of the benthos.
- The statement, “Collectively, sea pens, soft corals, stony corals, and sponges are represented across the shelf, slopes and banks of the Study Area but are found at their highest densities along the slopes, i.e. depths > 200 m.”, requires addition of references Wareham and Edinger (2007); Wareham (2010).
- The statement, “Sponges, in contrast are more widely distributed and high densities can be found along the eastern slopes of the Grand Banks, around the Flemish Cap and along the northern slopes of the SEA Area”, requires a reference.
- Regarding the statement, “In response to the known sensitivity of coral and sponge grounds, many a number of important coral and sponge areas have been designated as Vulnerable Marine Ecosystems (VMEs) (DFO 2012b) and are protected from damaging fishing activities in Canadian and NAFO waters.”, it should be noted that with the exception of a portion of the SW Grand Banks slope closure, these fishing closures occur in the NAFO regulatory area outside Canadian waters.
- Table 4.61 – The final column of this table is difficult to read. The number of digits after the decimal is inconsistent and the information is center justified, both of which are inappropriate formats for displaying such data. A right justified and constant number of digits after the decimal (suggested one digit past the decimal to be sufficient for “summary” statistics where precision is unwarranted).
- Figures 4.70 and 4.71 – The time period covered by the coral and sponge RV records should be stated in the figure titles.

Section 4.2.1.6 – Marine Fish

- Table 4.62 and 4.63 – Tables are listed alphabetically by species. The order of the species should be taxonomic to permit grouping of species into various logical ecological groups.
- Table 4.62 – There is a notable the lack of the most recent publications describing feeding habits and distribution and abundance trends of the three wolffish species found in the study area. The following references should be included in the descriptions for Atlantic Wolffish, Northern Wolffish, and Spotted Wolffish: Simpson *et al.* (2013); Collins *et al.* (2014).

- Table 4.62 – Atlantic Wolffish Habitat and Distribution – Wolffish are found over a variety of substrates (not just “hard clay bottom”), and at depths less than 25 m, and in excess of 250 m.
- Table 4.62 – That Atlantic Wolffish can be retained under SARA, unlike the other two wolffish species, deserves mention, even if this species is not “commercially significant”.
- Table 4.62 – Include fish species as an important component of Cusk diet (Bowman *et al.* 2000). Also include that Cusk is monotypic species in the Northwest Atlantic.
- Table 4.62 – The statement, “A number of research initiatives have also characterized benthic communities on the Grand Banks (Schneider *et al.* 1987; Kenchington *et al.* 2001)”, should include the following references Gilkinson, 2013; Gale *et al.* (in press). Gilkinson (2013) documents benthic communities over areas of Grand Bank as part of the DFO NL NEREUS Ecosystem Research Initiative, which involved a 3-year grab sampling program during multispecies trawl surveys. Gale *et al.* (in press) describe seastar (Asteroidea) assemblages and habitat use over wide areas of the eastern Canadian continental shelf and slope based on DFO survey trawl bycatch records and ROV video.
- Northern Wolffish – The statement “...occurs in Arctic seas on both sides of the North Atlantic Ocean” should be rewritten. Northern Wolffish occurs in both Arctic and Atlantic Oceans – as do other wolffish species, though no mention of this is made. The fact that Northern Wolffish is more pelagic than the other two species should also be noted.
- The statement that Northern Wolffish is distributed as a ‘widespread self-assemblage’, is incorrect. Northern Wolffish are mostly found along the shelf edge, not on the shelf.
- It should be included that, in the past, redfish larvae dominated the ichthyoplankton in many parts of the SEA area (Serebryakov *et al.* 1987).
- The introduction of invasive species and changes to habitat and/or community structure should also be discussed in the context of cumulative effects.
- The statement, “A total of four invertebrate taxa (snow crab, northern shrimp, pink striped shrimp, and shrimp *Pandalus propinquus*) were available from the Canadian Research Vessel surveys (Table 4.60)”, requires clarification. These are the major commercial spp., however many other non-commercial taxa have been processed using standardized protocols during RV surveys since 2005/2006. The point of availability is inaccurate.
- Roughhead Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic, only. A publication by Edinger *et al.* (2007) contains information on Roughhead Grenadier in NL waters. Specifically, it reports that Roughhead Grenadier were found in association with deep-sea corals, such as gorgonians, antipatharians, and soft corals, at depths of 200-1000 m.
- Roundnose Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic only. In the Northwest Atlantic, the species has been caught at depths less than 400 m. The data provided for NL comes from Parsons 1976. Newer information is available, in Power and Maddock Parsons (1998) and Kulka (2001). Most catches of this species occurred at depths of 900 m or more.
- Spotted Wolffish – Spawning in late autumn and early winter was suggested by Templeman 1966. A more recent publication (Templeman 1986) suggested mid to late summer spawning (July-August-Sept).
- White Hake – White Hake occur at depths much less than 200 m. On the western St. Pierre Bank, and southwest slope of the Grand Bank, they frequently occur at around 100 m (Han

and Kulka 2007). Juvenile White Hake are commonly found inshore, and may even occupy estuaries. Reference to Longfin Hake (*U. chesteri*) is not appropriate.

- White Hake – Not all juvenile White Hake are pelagic. The juvenile stage of the life cycle is characterized by pelagic and (later) demersal components.
- Winter Skate – Kelly and Hanson (2013) estimated that 40-70 egg cases are deposited each year. Also, cephalopods (squid) are an important component of the diet.
- Herring – The occurrence for this species has been recorded up to 450 m in multispecies surveys.
- Capelin – Capelin are found in 3NLOPs in spring RV survey. Include 3K and 2J from fall RV survey. Besides the RV trawl surveys, capelin distribution information is available from annual DFO acoustic surveys.
- The information related to ‘subsequently spent adults...’ is incorrect and wrongly cited. Spent females move out to deeper water after spawning on beaches/bottom sites. Those that survive eventually migrate to offshore feeding areas and likely aggregate with capelin that will be maturing and spawning next year. The timing, the route, and the mechanisms used to migrate from coastal waters to offshore feeding areas have not been knowingly documented.
- Include cephalopods as a major component of the Shortfin Mako diet.
- Include reproduction of White Sharks via internal fertilization, with development characterized by aplacental viviparity (also known as ovoviviparity) with embryonic oophagy. See Saïdi *et al.* 2005.
- Table 4.54 – Capelin spawning on Southeast Shoal takes place in June, July. Capelin also spawn on the bottom in coastal waters.
- Table 4.54 – Capelin spawning time (cumulatively) on beaches and coastal bottom sites and the Southeast Shoal encompasses May, June, July, August.
- Table 4.54 – No corresponding footnote reference exists for superscript #4.
- Table 4.54 – Sandlance spawning season is winter (December-March) not June–August as indicated in the table.
- Table 4.65 – There is much accompanying text around this table related to the inflated representation introduced by comparing numbers among various body sizes (e.g., cod versus sand lance). Agreed this is important – suggested to add a Table be added as a companion table which reports not numbers, but rather weight of catch by species reflecting the biomass of the various species in the SEA area.
- Sandlance – Table 4.65 states Sandlance constitute 6% of RV catch while the text states they constitute 30%.
- Sandlance – The report should include information regarding habitat usage of Sandlance, i.e., burrowing in substrate part of day; migrating vertically to feed; and no distance migrations as are closely associated with their habitat.
- Sandlance – It should be noted that inshore and offshore sandlance are two different species. The report should highlight which species is impacted by any proposed work.

- Atlantic Cod – Other than a line in one of the tables in this section of the report, there is no mention of Atlantic cod, despite the existence of a published Atlantic cod Recovery Potential Assessment in 2011 (DFO-CSAS).

Section 4.2.1.8 – Environmental Influence and Changes

- This section does provide useful information on climate change on fish and invertebrates; however, the context needs to be improved with the addition of information of the role of the North Atlantic Oscillation (NAO) and more comprehensive text on climate change generally (either in the existing text or earlier in sections on the physical environmental setting).

Section 4.2.1.9 – Aquatic Invasive Species

- Table 4.67 – Green crab is also one of the few AIS which are known to destroy fish habitat (i.e., eelgrass), thereby affecting recruitment of some species (e.g., Morris et al 2010).

Section 4.2.1.10 – Ecologically and Biologically Significant Species (EBSAs)

- The recent identification and description of additional EBSAs in the NL Shelves area (DFO 2013) has not been incorporated into this report. The data layers for these EBSAs can be provided upon request. Notably, The Orphan Spur EBSA, and possibly the edge of the Notre Dame Channel EBSA, overlap with the study area.
- Ecologically and Biologically Significant Areas (EBSAs) – *Southeast Shoal and Tail of the Banks*: It should also be noted here that the Southeast Shoal is an area with some of the highest (if not the highest) benthic biomasses recorded anywhere in the world due to the standing biomass of populations of the Arctic wedge clam, *Mesodesma* sp.
- Figure 4.89 – It is unnecessary for EBSAs outside the Eastern NL SEA boundaries to be included.

Section 4.2.1.11 – Other Ecologically Important Areas

- Figure 4.90 – Ecologically Important Areas Identified in the Orphan Basin SEA (2003). The color designation for the Orphan Basin area should be a darker shade to differentiate from the surrounding area.
- Legends provide a color scheme for abundance/biomass/species richness in Figures 4.91-4.93. It is not indicated how these were derived. No units are shown.

Section 4.2.3 – Marine Mammals and Sea Turtles

Given the objectives of the SEA, the document is generally well written as it pertains to marine mammals.

- The information on Pinnepeds (Section 4.2.3.3) needs to be expanded so that harp seals, hood seals and grey seals are treated separately in the summary table (i.e. in the same manner key whale species were addressed). Although there are similarities in the ecology of harps and hoods, there are enough differences that lumping both species together results in a summary table with content that is too general to be useful. The timing and use of ice habitat for whelping needs to be a focus for each of these two species. There is also a climate change aspect that should be presented and discussed (there is published literature on this topic as well as new information becoming available pers. comm. Garry Stenson). Note that a recent publication on satellite movements of hooded seals indicates that there is significant feeding along the shelf edge to the east of the 'Northeast Shelf Slope' EBSA (Anderson *et al.* 2012).

- Note that there are likely harbour seals present along the southern shore of the Avalon Peninsula for most of the year in addition to the Bays along the south coast. Also, note that this March the Convention on Biological Diversity conducted a science advisory workshop to delineate EBSAs in the Northwest Atlantic Area beyond the 200mile limit. One area that was identified was the shelf break area from the Lilly/Carson Canyon area extending northward to 48° N.

Section 4.3 – Human Activities (4.3.4 Marine Fisheries)

An incomplete (and potentially misleading) description of fishing activities exists in the SEA. Virtually the entire section related to marine fisheries within the current SEA is constructed on the basis of Canadian fisheries, or foreign fisheries which land their catches in Canadian ports. This view of the fishing activities that take place in the SEA study area is limited and incomplete. The entire section related to this topic suggests a distribution of fishing activities that omits entirely the international fisheries operating outside the EEZ managed by NAFO, and therefore most of the maps could mislead an uninformed reader to believe, for example, that there is essentially no fishing going on in the Flemish Cap, or that the Sackville Spur has no fishing whatsoever, when in reality this is one of the areas in the region that has the highest levels of fishing effort (e.g. NAFO 2012a).

Explicitly, it is not implied that these omissions and shortcomings are intentional, but it is highlighted that they effectively render the entire analysis of marine fisheries useless. The SEA states, *“Although the DFO datasets are known not to be comprehensive, particularly with regard to important inshore fisheries, the information provides a useful regional picture of fishing activity in the area that is considered adequate and appropriate for the purposes of the SEA”*. However, this cannot be assumed true. Offshore, without integrating the information from Canadian and international fisheries it is impossible to assess if the picture provided is adequate and appropriate. As such, the entire section on marine fisheries should be redone to incorporate international fishing effort data. These data, in aggregated format, could be requested from the NAFO Secretariat. Note also that Campbell and Feridizon (2013) provide data for fishing vessel activity in the areas governed by NAFO for 2011 and 2012.

To permit a general visual comparison of fisheries activities in the study area with and without inclusion of NAFO data, see Figure 1; Appendix 1 that compares Figure 4.122 from the SEA report (commercial fishing locations in 2008-2012) and Figure 4.2.2.1.7 from NAFO (2012a) (common fishing effort areas derived from VMS data in 2008-2011). Such information should be combined with the fishing effort information from DFO to provide a complete picture of fishing in the SEA area.

Section 5 – Environmental Interactions, Mitigation and Planning Considerations

In general, with regards to environmental interactions, mitigation and planning considerations, the report presents an overview of some of the possible interrelationships resulting from potential offshore oil and gas activities on the Grand Bank and adjacent areas (e.g., Table 5.1) by listing the major activities related to seismic surveys, exploration, drilling and production activities, and how these activities might potentially impact fish and fish habitat, while considering results from previous studies and other sources of available information. However, some areas remain vague in this regard, as do many of the environmental mitigation measures.

Section 5.1 – Fish and Fish habitat (effects assessment)

- This section is a weak summary of other summaries. It is not comprehensive and will not serve as a useful reference. Our understanding has changed dramatically with the research following the Macondo blowout. This should be reflected in this summary.

- Table 5.1 – Information in the table is not adequate. The table is incomplete and often cites reviews of reviews. It is noted in the header that the table is a “Summary of Some Known and Potential Environmental Effects Based on Available Information Sources”. This implies that a thorough job of reviewing and summarizing the existing literature for this aspect of the report was not undertaken.
- Table 5.1 – It should be noted that accidental spills of oils or other substances onto the Southeast Shoal during the period capelin are spawning, eggs are incubating, and yolk sac larvae are in the sediment could have a negative impact on that year class and subsequent spawning biomass.
- The bullet, “Changes in the presence, abundance, distribution and/or health of fish and invertebrates...” is vague. Direct mortality of marine organisms (at various stages of development) resulting from exposure to oil pills should be stated explicitly instead.
- Produced water effects should include increased nutrient loading and the ecosystem consequences for benthic pelagic coupling and production (Rivkin *et al.* 2000).
- Tannen *et al.* (2nd line) is cited incorrectly. The effects found relate to increased oxygen demand not oxygen enrichment. Produced water effects in this section are related to discharge not flaring. Rye *et al.* (2003) is not in the list of references.
- Mitigations for ballast water introduction of invasive species are included, but not for fouling organisms on hulls, drilling rigs or equipment. Protocols for mitigation of these introduction vectors should also be included in this section.
- It is indicated that the Southeast Shoal is a nursery for yellowtail flounder. However, it should also be acknowledged that the Southeast Shoal is the only spawning site for the Southeast Shoal capelin stock.
- The report suggests as a mitigation procedure ‘*avoiding species at risk where possible during the planning and conduction of oil and gas activities in the offshore*’. However, since the three wolffish species are found throughout the study area, no practical avoidance exists. What should be a practical mitigation measure in the case of wolffish or white sharks?
- There are no considerations in the report regarding accidental oil spills vis-à-vis fish species at risk and their habitat. This study includes the spatial distribution of abundance indices for the three wolffish species; and potential spatial and temporal trajectories of oil spills have been modelled and/or simulated in previous studies (e.g. Net Environmental Benefit Analysis of Dispersant Use for Responding to Oil Spills from Oil and Gas Facilities on the Newfoundland Grand Banks, 2013); both sources of information could be used to assess the impact of oil spills on the wolffish populations components found in the study area and could also be used as a framework for identifying appropriate mitigation measures in the case of oil spills.

Section 5.3 – Marine Mammals and Sea Turtles (Effects Assessment)

This section of the document is generally well written as it pertains to marine mammals given the objectives of the SEA. However, it is noted the sections on Important Areas and Times for each of the key VEC species groups (e.g. Marine Mammals and Sea Turtles - 5.3.3.2) have considerable repetition from earlier sections of text. While some of this is warranted, there should also be an effort to link this information with the appropriate mitigation measures presented in each of the preceding sections of text.

- The risk from ingestion of floating debris (i.e. plastic bags) for turtles should be discussed and garbage management and on shore disposal proposed as mitigations.

Section 5.4 – Sensitive and Special Areas (Effects Assessment)

- The effects of drilling wastes on sensitive and sessile benthic species such as corals and sponges is not well understood. However, since they are filter feeders and known to be sensitive to increased sedimentation, organic matter loading and quality of suspended particulate material it can anticipated that they will be negatively affected. There is also very little information on the potential effects of seismic exploration on these organisms. These aspects should be highlighted as a critical information gap within this consideration of sensitive and special areas.
- The mitigation for cumulative effects is to reduce overlap of projects. This is not realistic. Overall this section is inadequate and does not summarize or address the potential for cumulative effects. It should include interactions between activities as well as thresholds for effects and consider climate, habitat and foodweb change as possible drivers.
- This section implies that only designated VMEs and Coral Areas will be considered in this section. Other coral and sponge populations are only briefly referred to in the ecosystem overview and generally ignored in the assessment of potential effects.

Section 5.6 – Cumulative Environmental Effects

This section is very superficial as presented. It is noted within the report that information on cumulative effects is undeveloped here because upcoming projects and their footprints are unknown. However, there is there is also no attempt to describe how cumulative effects are currently being assessed nor is there acknowledgment and discussion regarding the advancements in cumulative effects research in recent years. These issues need to be addressed.

Specifically regarding the issue of unknown projects and unknown project footprint sizes as an explanation for providing no relevant industry information, it is noted that it is indicated elsewhere in the current SEA and on the C-NLOPB website that up to ten Environmental Assessments for petroleum exploration/production activities are in progress. At the very least, an overview and time line of these activities should be presented here.

Note: DFO conducted a National Science Advisory Process to develop a new framework for large project cumulative effects on marine mammals in March 2014 – contact J. Lawson for details on when this information will become available.

Section 5.7 Information Availability, Requirements and Opportunities

Coral and sponge effects and sensitivity should be identified as a significant information gap.

Section 6 – Summary and Conclusions

Page 444 – Regarding the “**C-NLOPB Note: Recommendations and conclusions regarding the issuance of rights and any requirement on the restriction of offshore oil and gas activities in the SEA Study Area will be finalized for inclusion in the Eastern Newfoundland SEA Report following the conclusion of the regulatory and public comment period.**”, It is not clear what this note means. Does it mean that if DFO/NAFO wants to extend the closure of the coral and sponge VMEs to other human activities that CNLOPB will include this in the SEA?

CONCLUSION

In conclusion, the quality of scientific content presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the document can be considered a reliable source of guidance for policy and management decision-making.

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April 16, 2014

Sources of information

This Science Response Report results from the Science Response Process of April 2014 for the Science Review of the Eastern Newfoundland Strategic Environmental Assessment (SEA).

Additional publications from this meeting will be posted on the [\(DFO\) Science Advisory Schedule](#) as they become available.

Andersen, J. *et al.* 2012. Habitat selection by hooded seals in the Northwest Atlantic Ocean. ICES J of Marine Science.

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Appendix 1: Figures

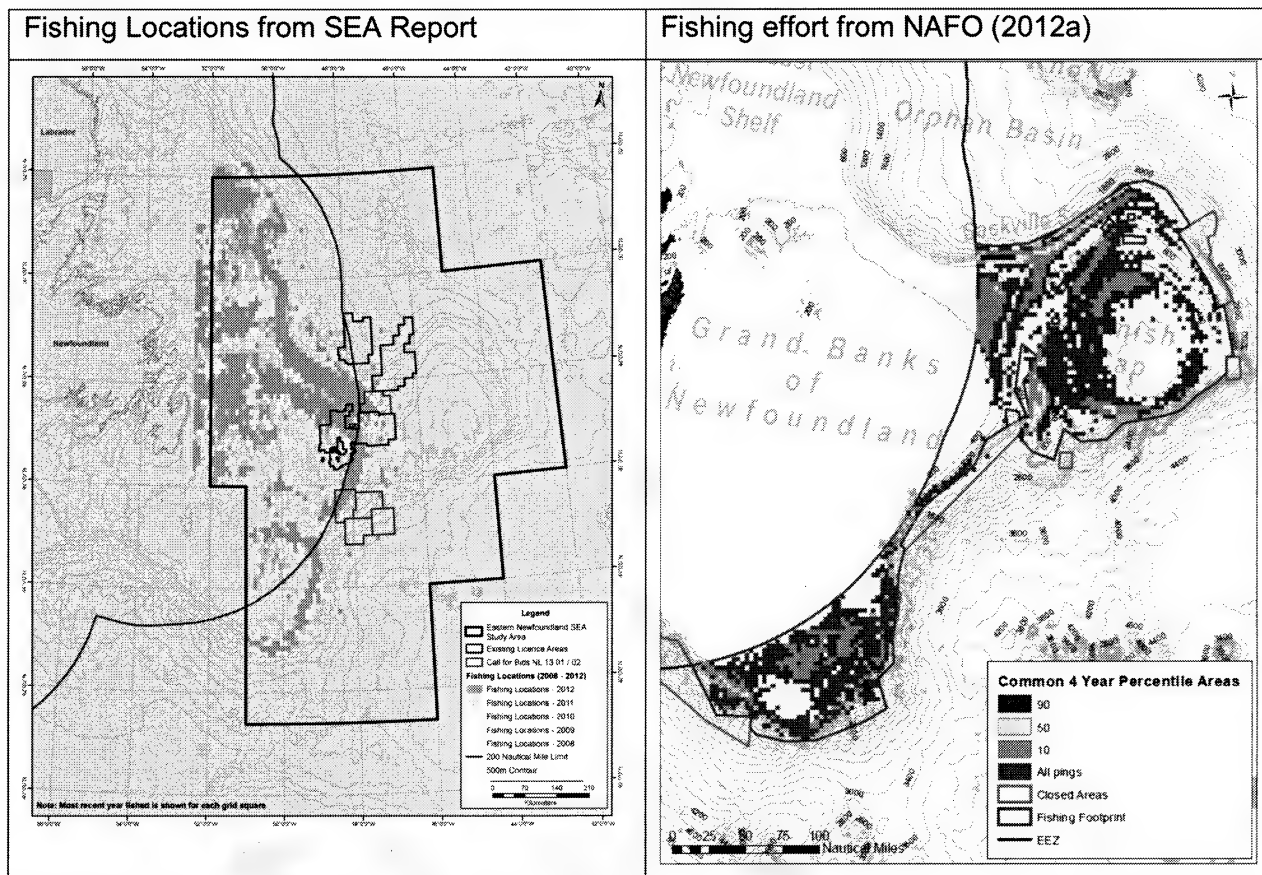


Figure 1. Comparison of Fishing Locations mapping from the Eastern Newfoundland Sea and NAFO.

This Report is Available from the

Center for Science Advice (CSA)
Newfoundland and Labrador Region
Fisheries and Oceans Canada
PO Box 5667
St. John's, NL A1C 5X1

Telephone: (709) 772-3688

E-Mail: DFONL.CentreforScienceAdvice@dfo-mpo.gc.ca

Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-3769

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Correct Citation for this Publication:

DFO. 2014. Update of Stock Status Indicators for Northern Shrimp, *Pandalus borealis*, in Shrimp Fishing Areas 4, 5 and 6. DFO Can. Sci. Advis. Sec. Sci. Resp. 2014/nnn.

Aussi disponible en français :

MPO. 2014. Mise à jour des indicateurs de l'état du stock pour la crevette nordique (*Pandalus borealis*) dans les zones de pêche de la crevette 4, 5 et 6. Secr. can. de consult. sci. du MPO, Rép. des Sci. 2014/nnn.

Templeman, Nadine

From: Wells, Nadine
Sent: April-14-14 1:36 PM
To: Templeman, Nadine s.19(1)
Cc: Clarke, Keith
Subject: RE: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review

My comments have been incorporated. [REDACTED] I'm sure it took some time. Cheers,

Nadine

From: Templeman, Nadine
Sent: 2014-April-14 12:46 PM
To: Anderson, M. Robin; Gregory, Robert; Koen-Alonso, Mariano; Wells, Nadine; Gilkinson, Kent; Sjare, Becky; Bourne, Christina M; Mowbray, Fran; Simpson, Mark R
Cc: Templeman, Nadine; Richards, Dale E; Mansour, Atef A H
Subject: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review
Importance: High

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Any questions, please email for the time being (or come see me) as I have moved into what was Krystine's old office and am currently without a phone line.

Thanks again, and cheers,

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Nadine.

Nadine Templeman, B.Sc., M.Env.Sci.
Science Advisor/Coordinator/ Conseiller/Coordinateur Scientifique
Centre for Science Advice/ Centre pour le conseil de Science
Science Branch / Direction des sciences
Fisheries and Oceans Canada / Pêches et Océans Canada
P. O. Box 5667 / C. P. 5667
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A1C 5X1
Telephone / Téléphone: (709)772-3688
Facsimile / Télécopieur: (709)772-5315
E-mail / E-mail: nadine.templeman@dfo-mpo.gc.ca

><((((> . . . <))))>< . . . ><((((> . . . <))))><

From: Richards, Dale E
Sent: March 7, 2014 3:40 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason; Sooley, Darrin; Wells, Nadine; Nakashima, Brian; Hamoutene, Dounia
Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments April 2, 2014
Importance: High

Good afternoon,

Following several delays, the 'Draft' Eastern Newfoundland SEA has finally been posted on the CLNOPB website. It can be accessed at the following link: <http://www.cnlopb.nl.ca/enlsea.shtml>. The full SEA document along with the associated SEA appendices have also been posted on the shared Science drive under the Science folder: Science Info/CSA Review/ Habitat/ SEA & EA/ Eastern NL SEA March 2014 request. Please note that I have not removed the 'Eastern NL SEA December 2013' files from the shared folder by chance that someone wishes to compare the two draft versions. However, if you have not commenced your review please be sure to use to the most recent version of these SEA files.

To date I have received a few submissions pertaining to this request and this content will be included in the Science response memo. To those Sections that still intend on sending along comments or additional revisions the CSA Office will require such submissions by **April 2nd**.

Listed below are specific Sections of the EA Report which require Science review:

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- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
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- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
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Please give me a call if you have any questions on this process.

Thank you,
Dale

From: Richards, Dale E
Sent: January 31, 2014 1:47 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason
Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

Good afternoon,

There has been a further delay in the submission of the Eastern Newfoundland SEA for review. The latest I have received from the FPP (via the CLNOPB) is that the 'final' draft report will be made available to us for review the end of February. I will continue to keep you updated as CSA receives any information.

Dale

From: Richards, Dale E
Sent: January 7, 2014 12:59 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason
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As soon as the CSA Unit receives an update from FPP, I will send out a revised deadline to this request. At this point, a 3-week delay to obtain the 'final' draft SEA is anticipated.

Please give me a call if you have any questions on this process.

Thank you,
Dale

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Sent: December 23, 2013 4:56 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comments
January 20, 2014

Good afternoon,

In consultation with the RDS-Office, the CSA Unit has decided that based on the timing of this request and the draft nature of the Eastern Newfoundland SEA report that this request for advice will be provided to Ecosystems Management via a memo. i.e. there will be no formal Science meeting or SSRP process at this time. To that end, comments on the SEA report will be needed by the CSA office by **Monday, January 20th**. This will allow the CSA Unit a few days to compile the comments.

Section heads, please ensure that this request and deadline is sent to the appropriate scientist within your section. For your reference, the original e-mail is provided below.

If you have any questions, please let me know.

Thank you,
Dale

From: Richards, Dale E

Sent: December 2, 2013 2:19 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry

Subject: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comment mid-January 2014 - Please action

Good afternoon,

CSA has received, from the FPP (via the C-NLOPB) for review, the Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1.

DFO is providing expert advice, to support the C-NLOPB, on baseline conditions (i.e. environmental setting) and mitigations related to potential impacts of oil and gas activities on fish, fish resources, SAR, sensitive areas and DFO research activities.

To provide context related to the SEA process please see Section 2: SEA - Scope and Approach.

The Science review should focus on whether the baseline information is accurate and that the effects assessment, taking into consideration departmental guidance such as the "Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment"

Listed below are specific Sections of the EA Report which require Science review and comments:

Environmental Setting

- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Protected and Other Designated Sensitive Areas
-

Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
- Section 5.3 – Marine Mammals and Sea Turtles (including Species at Risk and Other Key Species)
- Section 5.4 – Sensitive Areas

The FPP has requested that Science provide comments by the end of January. In the interim, until a Branch decision has been made on how this request for advice is going to be handled (i.e. memo or SSRP process), I have placed the SEA report on the shared drive in the '**CSA Review**' folder, subfolder '**Eastern Newfoundland SEA - December 2013 Request**'. This will allow the maximum time available to Science to review and provide comment on the report. Whether a SSRP process takes place or a memo is formulated, I suspect that comments will be required from individual scientists by **mid-January 2014**. I will be in touch at a later date regarding specific deadlines and what format this request for advice will take.

As always, if you have any questions please let me know. Section heads, please ensure that this request is sent to the appropriate scientist within your section.

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Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO

<http://www.dfo-mpo.gc.ca/csas-sccs/>

Templeman, Nadine

From: Gregory, Robert
Sent: April-14-14 2:54 PM
To: Templeman, Nadine
Subject: RE: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review

Hi Nadine,

I just finished reading through the Draft Science Response. It looks fine.

Cheers,

Bob

Dr Robert S. Gregory, Research Scientist
Director, Centre of Expertise for Aquatic Habitat Research
Ecological Sciences Section
Fisheries & Oceans Canada
80 E. White Hills Rd., PO Box 5667 St. John's NL A1C 5X1 CANADA

1-709-772-4491 phone
1-709-772-5315 fax
email: Robert.Gregory@dfo-mpo.gc.ca

From: Templeman, Nadine
Sent: April 14, 2014 12:46 PM
To: Anderson, M. Robin; Gregory, Robert; Koen-Alonso, Mariano; Wells, Nadine; Wilkinson, Kent; Sjare, Becky; Bourne, Christina M; Mowbray, Fran; Simpson, Mark R
Cc: Templeman, Nadine; Richards, Dale E; Mansour, Atef A H
Subject: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review
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This last minute change in approach is in light of a short (although much needed) extension granted to Science Branch by the CNLOPB late last week in order for DFO to collate significant feedback received from its review. As it was Science Branch original desire to undertake a formal process for communicating the feedback from this review, we have decided that the extra couple of days will now allow us the time needed to convert the collated response from its original Memo format to draft a Science Response as the vehicle to communicate Science review/feedback. This advice will now be accessible to the public via the CSAS website upon completion. This is important given the significant feedback you all provided.

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Nadine.

Nadine Templeman, B.Sc., M.Env.Sci.
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Science Branch / Direction des sciences
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[illegible]

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Fisheries and Oceans Canada / Pêches et Océans Canada

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Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO

<http://www.dfo-mpo.gc.ca/csas-sccs/>

Templeman, Nadine

From: Bourne, Christina M
Sent: April-14-14 12:51 PM
To: Templeman, Nadine
Subject: RE: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review

The herring data point is correct.

Christina

From: Templeman, Nadine
Sent: April-14-14 12:46 PM
To: Anderson, M. Robin; Gregory, Robert; Koen-Alonso, Mariano; Wells, Nadine; Gilkinson, Kent; Sjare, Becky; Bourne, Christina M; Mowbray, Fran; Simpson, Mark R
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Nadine.

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Fisheries and Oceans Canada / Pêches et Océans Canada
P. O. Box 5667 / C. P. 5667
St. John's, NL / St. John's, Terre-Neuve
A1C 5X1
Telephone / Téléphone: (709)772-3688
Facsimile / Télécopieur: (709)772-5315
E-mail / E-mail: nadine.templeman@dfo-mpo.gc.ca

><(((°> . . . °)))>< . . . °><(((°> . . . °)))><

From: Richards, Dale E
Sent: March 7, 2014 3:40 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason; Sooley, Darrin; Wells, Nadine; Nakashima, Brian; Hamoutene, Dounia
Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments April 2, 2014
Importance: High

Good afternoon,

Following several delays, the 'Draft' Eastern Newfoundland SEA has finally been posted on the CLNOPB website. It can be accessed at the following link: <http://www.cnlopb.nl.ca/enlsea.shtml>. The full SEA document along with the associated SEA appendices have also been posted on the shared Science drive under the Science folder: Science Info/CSA Review/ Habitat/ SEA & EA/ Eastern NL SEA March 2014 request. Please note that I have not removed the 'Eastern NL SEA December 2013' files from the shared folder by chance that someone wishes to compare the two draft versions. However, if you have not commenced your review please be sure to use to the most recent version of these SEA files.

To date I have received a few submissions pertaining to this request and this content will be included in the Science response memo. To those Sections that still intend on sending along comments or additional revisions the CSA Office will require such submissions by **April 2nd**.

Listed below are specific Sections of the EA Report which require Science review:

Environmental Setting

- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
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Please give me a call if you have any questions on this process.

Thank you,
Dale

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Sent: January 31, 2014 1:47 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine

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Good afternoon,

There has been a further delay in the submission of the Eastern Newfoundland SEA for review. The latest I have received from the FPP (via the CLNOPB) is that the 'final' draft report will be made available to us for review the end of February. I will continue to keep you updated as CSA receives any information.

Dale

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Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

The CLNOPB has advised that the submission of the 'final' draft report - Eastern Newfoundland SEA - to FPP will be delayed until the end of January. This 'final' draft will be an update to the 'preliminary' Draft #1 version highlighted in the e-mail below and posted on the Science shared drive prior to the Christmas break. Based on this information, we know that an extension on this request for advice will be forthcoming. Thus, it may be advisable to delay your review of the preliminary draft of the SEA report until the final draft becomes available.

As soon as the CSA Unit receives an update from FPP, I will send out a revised deadline to this request. At this point, a 3-week delay to obtain the 'final' draft SEA is anticipated.

Please give me a call if you have any questions on this process.

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Subject: RE: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comments January 20, 2014

Good afternoon,

In consultation with the RDS-Office, the CSA Unit has decided that based on the timing of this request and the draft nature of the Eastern Newfoundland SEA report that this request for advice will be provided to Ecosystems Management via a memo. i.e. there will be no formal Science meeting or SSRP process at this time. To that end, comments on the SEA report will be needed by the CSA office by **Monday, January 20th**. This will allow the CSA Unit a few days to compile the comments.

Section heads, please ensure that this request and deadline is sent to the appropriate scientist within your section. For your reference, the original e-mail is provided below.

If you have any questions, please let me know.

Thank you,
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Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry

Subject: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comment mid-January 2014 - Please action

Good afternoon,

CSA has received, from the FPP (via the C-NLOPB) for review, the Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1.

DFO is providing expert advice, to support the C-NLOPB, on baseline conditions (i.e. environmental setting) and mitigations related to potential impacts of oil and gas activities on fish, fish resources, SAR, sensitive areas and DFO research activities.

To provide context related to the SEA process please see Section 2: SEA - Scope and Approach.

The Science review should focus on whether the baseline information is accurate and that the effects assessment, taking into consideration departmental guidance such as the "Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment"

Listed below are specific Sections of the EA Report which require Science review and comments:

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- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
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- Section 5.4 – Sensitive Areas

The FPP has requested that Science provide comments by the end of January. In the interim, until a Branch decision has been made on how this request for advice is going to be handled (i.e. memo or SSRP process), I have placed the SEA report on the shared drive in the '**CSA Review**' folder, subfolder '**Eastern Newfoundland SEA - December 2013 Request**'. This will allow the maximum time available to Science to review and provide comment on the report. Whether a SSRP process takes place or a memo is formulated, I suspect that comments will be required from individual scientists by **mid-January 2014**. I will be in touch at a later date regarding specific deadlines and what format this request for advice will take.

As always, if you have any questions please let me know. Section heads, please ensure that this request is sent to the appropriate scientist within your section.

Thank you,
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E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

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Fisheries and Oceans Canada / Pêches et Océans Canada

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Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO

<http://www.dfo-mpo.gc.ca/csas-sccs/>

Templeman, Nadine

From: Gilkinson, Kent
Sent: April-15-14 10:11 AM
To: Templeman, Nadine
Subject: RE: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review

Oh, just one thing. The CSAS reference Gilkinson 2012 should be 2013 which is when it was published although it was ear marked as a CSAS Res Doc 2012/114. One of those weird CSAS things.

Cheers, Kent

From: Templeman, Nadine
Sent: April 15, 2014 10:05 AM
To: Gilkinson, Kent
Subject: RE: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review

Thanks Kent ☺

From: Gilkinson, Kent
Sent: April 15, 2014 10:03 AM
To: Templeman, Nadine
Subject: RE: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review

Hi Nadine. I note that my comments have been incorporated.

Cheers, Kent

From: Templeman, Nadine
Sent: April 14, 2014 12:46 PM
To: Anderson, M. Robin; Gregory, Robert; Koen-Alonso, Mariano; Wells, Nadine; Gilkinson, Kent; Sjare, Becky; Bourne, Christina M; Mowbray, Fran; Simpson, Mark R
Cc: Templeman, Nadine; Richards, Dale E; Mansour, Atef A H
Subject: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review
Importance: High

Good day everyone,

Please note, as you may have anticipated, the feedback from the Science review of the Draft Eastern Newfoundland Strategic Environmental Assessment (SEA) is now being moved over to a formal Science Response Process. Also note that I will be taking over this file from Dale from this point on.

This last minute change in approach is in light of a short (although much needed) extension granted to Science Branch by the CNLOPB late last week in order for DFO to collate significant feedback received from its review. As it was Science Branch original desire to undertake a formal process for communicating the feedback from this review, we have decided that the extra couple of days will now allow us the time needed to convert the collated response from its original Memo format to draft a Science Response as the vehicle to communicate Science review/feedback. This advice will now be accessible to the public via the CSAS website upon completion. This is important given the significant feedback you all provided.

Due to tight timelines, I am proposing the use of email as opposed to a face to face meeting to review the draft Science Response. Please review the draft Science Response attached, noting whether your views were incorporated appropriately, and the whether you are comfortable with the conclusions provided. Feedback will be appreciated via email and/or tracked changes at your earliest convenience to the deadline of **12 NOON, Wednesday, April 16**. Albeit short, this deadline will allow time to determine if there are any significant issues that need to be addressed prior to finalizing the Science Response for RDS approval and subsequent submission to FPP on the agreed-upon deadline of Thursday, April 17.

Any questions, please email for the time being (or come see me) as I have moved into what was Krystine's old office and am currently without a phone line.

Thanks again, and cheers,

<< File: CSAS SRR 2014_nnn Eastern Newfoundland SEA (Draft for Review).docx >>

Nadine.

Nadine Templeman, B.Sc., M.Env.Sci.
Science Advisor/Coordinator/ Conseiller/Coordinateur Scientifique
Centre for Science Advice/ Centre pour le conseil de Science
Science Branch / Direction des sciences
Fisheries and Oceans Canada / Pêches et Océans Canada
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Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

5

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<http://www.dfo-mpo.gc.ca/csas-sccs/>

Richards, Dale E

De: Koen-Alonso, Mariano
Envoyé: April-16-14 11:42 AM
À: Templeman, Nadine; Anderson, M. Robin; Gregory, Robert; Wells, Nadine; Gilkinson, Kent; Sjare, Becky; Bourne, Christina M; Mowbray, Fran; Simpson, Mark R
Cc: Richards, Dale E; Mansour, Atef A H
Objet: RE: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review

Hi Nadine,

My points have been well captured within this document. I have made really minor changes in the attached file, but these edits are simply of form and clarification, not of content. I am really happy that we are making a science response out of the feedback that people provided. This issue deserved this level of attention. And to be fair, in the same way I have been openly critical with other decisions, kudos this time for this one.

Take care, cheers, and good luck,
Mariano



CSAS SRR
2014_nnn Easter...

Mariano Koen-Alonso
Northwest Atlantic Fisheries Centre | Centre des pêches de l'Atlantique Nord-Ouest
Fisheries and Oceans Canada | Pêches et Océans Canada
80 East White Hills Road, PO Box 5667
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Government of Canada | Gouvernement du Canada

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Importance: High

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Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

Good afternoon,

There has been a further delay in the submission of the Eastern Newfoundland SEA for review. The latest I have received from the FPP (via the CLNOPB) is that the 'final' draft report will be made available to us for review the end of February. I will continue to keep you updated as CSA receives any information.

Dale

From: Richards, Dale E

Sent: January 7, 2014 12:59 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

The CLNOPB has advised that the submission of the 'final' draft report - Eastern Newfoundland SEA - to FPP will be delayed until the end of January. This 'final' draft will be an update to the 'preliminary' Draft #1 version highlighted in the e-mail below and posted on the Science shared drive prior to the Christmas break. Based on this information, we know that an extension on this request for advice will be forthcoming. Thus, it may be advisable to delay your review of the preliminary draft of the SEA report until the final draft becomes available.

As soon as the CSA Unit receives an update from FPP, I will send out a revised deadline to this request. At this point, a 3-week delay to obtain the 'final' draft SEA is anticipated.

Please give me a call if you have any questions on this process.

Thank you,
Dale

From: Richards, Dale E

Sent: December 23, 2013 4:56 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comments January 20, 2014

Good afternoon,

In consultation with the RDS-Office, the CSA Unit has decided that based on the timing of this request and the draft nature of the Eastern Newfoundland SEA report that this request for advice will be provided to Ecosystems Management via a memo. i.e. there will be no formal Science meeting or SSRP process at this time. To that end, comments on the SEA report will be needed by the CSA office by **Monday, January 20th**. This will allow the CSA Unit a few days to compile the comments.

Section heads, please ensure that this request and deadline is sent to the appropriate scientist within your section. For your reference, the original e-mail is provided below.

If you have any questions, please let me know.

Thank you,
Dale

From: Richards, Dale E

Sent: December 2, 2013 2:19 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry
Subject: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comment mid-January 2014 - Please action

Good afternoon,

CSA has received, from the FPP (via the C-NLOPB) for review, the Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1.

DFO is providing expert advice, to support the C-NLOPB, on baseline conditions (i.e. environmental setting) and mitigations related to potential impacts of oil and gas activities on fish, fish resources, SAR, sensitive areas and DFO research activities.

To provide context related to the SEA process please see Section 2: SEA - Scope and Approach.

The Science review should focus on whether the baseline information is accurate and that the effects assessment, taking into consideration departmental guidance such as the "Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment"

Listed below are specific Sections of the EA Report which require Science review and comments:

Environmental Setting

- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Protected and Other Designated Sensitive Areas
-

Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
- Section 5.3 – Marine Mammals and Sea Turtles (including Species at Risk and Other Key Species)
- Section 5.4 – Sensitive Areas

The FPP has requested that Science provide comments by the end of January. In the interim, until a Branch decision has been made on how this request for advice is going to be handled (i.e. memo or SSRP process), I have placed the SEA report on the shared drive in the '**CSA Review**' folder, subfolder '**Eastern Newfoundland SEA - December 2013 Request**'. This will allow the maximum time available to Science to review and provide comment on the report. Whether a SSRP process takes place or a memo is formulated, I suspect that comments will be required from individual scientists by **mid-January 2014**. I will be in touch at a later date regarding specific deadlines and what format this request for advice will take.

As always, if you have any questions please let me know. Section heads, please ensure that this request is sent to the appropriate scientist within your section.

Thank you,
Dale

E. Dale Richards, B.Sc. Hons., M.Sc.
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Newfoundland and Labrador Region / La Région de Terre-Neuve et du Labrador
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<http://www.dfo-mpo.gc.ca/csas-sccs/>

SCIENCE REVIEW OF THE EASTERN NEWFOUNDLAND STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

Context

Since 2002, the C-NLOPB has been conducting Strategic Environmental Assessments (SEAs) of portions of the Newfoundland and Labrador Offshore Area that may have the potential for offshore oil and gas exploration activity. SEA is a broad-based approach to environmental assessment that examines the environmental effects which may be associated with a plan, program or policy proposal and that allows for the incorporation of environmental considerations at the earliest stages of program planning. SEA typically involves a broader-scale environmental assessment (EA) that considers the larger ecological setting, rather than a project-specific environmental assessment that focuses on site-specific issues with defined boundaries. Notably, the accuracy of information in a SEA is especially important as it sets the basis for future project-specific EA within its study area.

On March 5, 2014, The Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) released the Draft Eastern Newfoundland Strategic Environmental Assessment (SEA) Report for public comment.

The Environmental Assessment and Major Projects (EAMP) Division of the DFO Ecosystems Management Branch in the Newfoundland and Labrador Region requested that DFO Science undertake a review of this document, and specifically the information put forward in the SEA on the (physical and biological) Environmental Setting: Section 4.1.4 (Oceanography); Section 4.1.5 (Ice conditions); Section 4.2.1 (Fish and Fish Habitat); Section 4.2.3 (Marine Mammals and Sea Turtles); Section 4.2.4 (Sensitive and Special Areas); as well as that on Environmental Interactions, Mitigation and Planning Considerations (i.e., the effects assessment): Section 5.1 (Fish and Fish Habitat); Section 5.3 (Marine Mammals and Sea Turtles); and Section 5.4 (Sensitive and Special Areas).

Given the short timeline to carry out a review, a DFO Science Response process was undertaken. Science expertise within Fisheries and Oceans, Newfoundland and Labrador Region was solicited to address this review – although the provision of feedback was limited to the areas of the report where expertise was available at the time of the review, including that from Ecological Sciences, Marine Mammals, Marine Fish Species at Risk and Pelagic Sections.

The review found that overall the quality of scientific information presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the final document can be considered a reliable source of guidance for policy and management decision-making.

This Science Response Report results from the April 2014 Science Response Process of for the DFO Science review of the “*Eastern Newfoundland Strategic Environmental Assessment (SEA) (AMEC November 2013)*.” The report is a summarization of the comments provided by DFO Science Branch, Newfoundland and Labrador Region, to the Marine Habitat Protection Section on the above noted sections, as well as other parts of the document with appropriate linkages to those.

Analysis and Response

General Comments

- As the *Eastern Newfoundland Strategic Environmental Assessment* is intended to identify and incorporate environmental considerations at the earliest stages of planning and decision making, it is expected to be broad in its scope, and relatively general in its description of potential impacts associated with oil and gas exploration and/or production in the region within the next decade. However, specific details still remain important in many regards as it is fundamental that the SEA provides a complete and comprehensive system-wide perspective in order to be useful for future project-specific EAs.
- Much of the information describing the existing environment is reasonably complete for the area of the SEA that falls inside the 200 mile limit. However, specific information for the offshore (>200 miles) portion of the study area, and in particular the Flemish Cap and Orphan Basin, is lacking. This is largely attributable to lack of consideration of fishing and research data from NAFO sources and is considered a major weakness in the accuracy of the assessment.
- The SEA is lacking a comprehensive overview on climate change in its description of the physical environment. Only a few statements regarding climate change exist throughout, with nothing substantive reported. Information taken from existing models and the most current projections should be presented for key physical indices where available.
- The SEA does not adequately capture the complexity of the biological environment of the study area. The report does not describe functional ecosystem units or attempt to analyze impacts on their structure and function; but rather simply provides a list of components and compiles potential effects on them, as opposed to on the system as a whole. While this type of description is useful, it is not complete, and carries the risk of promoting “tunnel vision” approaches to management issues.
- The SEA is lacking in its consideration of important aspects of the ecosystem such as trophic structure, ecoregion configuration, linkages between the Grand Bank and the northern Newfoundland shelf, and bottom up regulation of ecosystem productivity – all of which are key to understanding the existing environment and potential interactions.
- The SEA provides incomplete descriptions of Vulnerable Marine Ecosystems (VMEs), and is lacking adequate information for characterization of VME indicator species, including their distribution and the potential impacts of oil and gas exploration/production and spills on these.
- The SEA consideration of potential environmental effects is basic at best, failing to synthesize the current understanding of potential effects. This is also the case for the sections on interactions with other human activities including fishing and sensitive and special areas. The potential for cumulative effects is mentioned in the report, but is not developed.
- The SEA contains data sets that appear to be dated (e.g., DFO fish survey data up to 2009; Sea Ice Atlas to 2010; some tropical storm data to 2000; MSC50 wave/current data to 2011; etc.) While it is understandable that some data sets may not be available after a certain date; it is, however, likely that some are available in an updated format (e.g., the most recent tropical storm data). As such, if a data set is ‘prematurely’ truncated or not being used for some reason – it should be stated as clarification within the report. Also, if there are additional data expected, it should be noted when they are likely to become available.

Specific Comments

Section 3.2 – Generic Description of Offshore Oil and Gas Activities

- Primary emissions from offshore production should explicitly list produced water since it is the largest waste stream from that activity.
- Spill data for NL offshore should be updated to include 2013. Spill discussion should also include that spills may be due to aging or leaky infrastructure.
- Oils spills scenarios under ice should be included in tables where available. Although they are mentioned as part of some of the studies, inclusion in the tables would prove useful.
- Table 3.4 – Numbers are not standardized per unit time or capacity; therefore, they are misleading. What are the “lifespans” of the wells in this table – i.e., how many of the 29,527 wells in the 1980’s were also operational in the 1970’s (and hence double counted)? The total number operating during each period may reduce the apparent blowout frequency by referencing existence in more than one of the time periods. The number of operating wells in 1971-80 plus the number of “new wells” minus the number of “decommissioned wells” would be a more meaningful number in this column in this comparison. The number of exploration vs. production wells would be very revealing also. It is suggested that revising the blowout instances per unit time of well operational life would be more informative than the numbers currently reported.
- Table 3.8 – Comments in the text related to the table suggests that 2% is some form of benchmark for oil spill dispersion rate. It is not clear what is the basis for reliance on such a number, what the reference authority for this number is, and whether it is an ecologically useful number.

Section 4.1 – Physical Environment

It is notable that the description of the physical environment lacks a comprehensive overview on climate change. While there are a few statements regarding climate change, nothing substantive is reported. This needs to be included in the SEA. In this, the document should include general information on the most current projections relative to air and sea temperatures, currents, primary productivity and changes in frequency of extreme weather based on regional climate change models. This would include consideration of which models are considered best right now for the study area in question; and data gaps and key uncertainties. These projections should be also be integrated into subsequent areas of text throughout the SEA as required (e.g. the sections on ice and ice bergs as well as in the species accounts where information is available).

Section 4.1.1 – Geology

- Note that multiple references for Piper (pers. comm.) exist in this section. Since this is an area of active research, and since the SEA is a living document, this section should be updated on a priority basis as the research is published.
- The explicit risk of a landslide (1/500) is included in the SEA, yet the risks for other geohazards are not specified. This is also reported as a personal communication which may not be particularly useful for future planning. This section should be updated to include the anticipated report from Natural Resources Canada that contains slope failure risk maps. This would provide operators with useful information at the planning stages.
- A map of the features of the Orphan Basin described in this section should be included. They are not in Figure 4.3.

Section 4.1.2 – Bathymetry

- As knowledge of bathymetry is important to understanding many key aspects of the physical and biological environment, it would be helpful to include major bathymetric contours/features in a clear manner on all maps depicted within the report (e.g., Figure 1.1), similar to that in Figure 2.2. Otherwise, maps provide very little frame of reference.
- Figure 4.6 – The figure should indicate in title or legend that bathymetry is in 'm'.

Section 4.1.3 – Climatology

- Precipitation figures need a better explanation for the y-axis indicating whether the frequency of occurrence (%) refers to event duration per month or number of events per month or per day.
- The data for frequency of thunderstorms looks odd. Figure 4.26 shows a big spike in July while Figure 4.28 has a big dip in September. Could these be the result of calculation errors? Since this is a 63-year climatology it should not be related to sample size and interannual variability.

Section 4.1.4 – Oceanography

- The description on extreme wind and wave events partially captures the level of integration and comprehensiveness that is required to make all the information presented useful. However, it is problematic in that it lacks a climate change context.

Section 4.2 – Biological Environment (4.2.1 Fish and Fish Habitat)

A poor description of the ecosystem structure in the study area exists in the SEA. The SEA study area actually expands over at least four different functional ecosystem production units: a) the Grand Bank, b) the Newfoundland-Labrador Shelf, both of them part of the Newfoundland-Labrador Shelves marine ecosystem, c) the Flemish Cap, which is considered a relatively closed marine ecosystem, and d) the oceanic waters beyond the continental shelf break. Furthermore, it includes the transition areas between these ecosystems, and given the large range in depths involved in SEA study area, it can also be argued that it expands over bathypelagic and abyssal oceanic ecosystems. These very basic descriptions, and their potential implications, are currently absent, and need to be incorporated in the SEA.

It should be noted that the basic ecoregion structure in the Grand Bank indicates that the Grand Bank and the Labrador-Newfoundland Shelf can be considered ecosystem sub-units, where the northern Grand Bank (NAFO Division 3L) acts as a transition zone between these subunits. It is also clear the existence of a distinct shelf-break ecoregion, which acts as a transition zone (ecotone) between shelf and oceanic realms (Pepin *et al.* 2010, NAFO 2010b, 2012a). The Flemish Cap also emerges as a distinct ecosystem production unit (Perez-Rodriguez *et al.* 2010, NAFO 2010b). The Grand Bank and Flemish Cap are among the candidate ecosystem management units being considered for the development of an ecosystem approach to fisheries by NAFO (NAFO 2010b).

Although the Newfoundland-Labrador Shelves and Flemish Cap have experienced collapses of major groundfish components, and share many of their core species, the structure of these ecosystems is not identical. For example, the key forage species in the [southern] Grand Bank are sandlance and capelin, shrimp and capelin in the [northern] Newfoundland-Labrador Shelf, while in the Flemish Cap redfish and shrimp have been key prey species for that ecosystem (NAFO 2010b, 2011, 2012, Perez-Rodriguez *et al.* 2011, 2012). Furthermore, in the NL shelves, there is evidence of bottom-up regulation of capelin, its overall core forage fish species, with linkages between environmental drivers (e.g. ice dynamics), phytoplankton blooms, zooplankton

abundance, and capelin dynamics (DFO 2012, Buren *et al.* 2014), and where the dynamics of upper trophic levels (e.g. Atlantic cod) seem to have been driven by availability of food (capelin) and fishing (DFO 2012, Buren *et al.*, submitted). The influence of ice dynamics on ecosystem trends is not observed in the Flemish Cap (NAFO 2011), where besides the impact of fishing, environmental drivers seem to be influencing recruitment success, while predation by top predators appears to regulate the dynamics of juvenile and smaller fishes (Perez-Rodriguez *et al.* 2013), and where strong trophic interactions are linking the core species (cod, redfish and shrimp) in the Flemish Cap ecosystem (NAFO 2011, 2012a).

The above highlights that while the basic ecosystem organization and dynamics that exists in the SEA study area is not described by the SEA document, there are analyses and information available to produce the strategic/broad base description that could provide managers/decision makers with a more functional and holistic perspective of the ecosystems that are potentially affected by oil and gas development.

Section 4.2.1 – Fish and Fish Habitat

- The report provides a comprehensive review of the biology, ecology, distribution and general aspects of the life history of several relevant fish species inhabiting the Grand Bank and southern Labrador shelf. In general the data shown in the Figures and Tables are accurate and informative, and the references cited in the report are generally up to date, with a few exceptions. An interesting aspect of this report is the integrated approach used to describe fish habitat and how it varied temporally and spatially, including the interrelationships of the various trophic/ecological components.
- The SEA contains only partial survey information and exhibits a lack of understanding of the limitations of the DFO trawl surveys. It is notable that the SEA only considers research survey information from DFO, but survey programs conducted by the European Union (EU), and/or some of its member states, exist. These research surveys, focused on the Flemish Cap, but also on the nose and tail of the Grand Bank, are routinely used by NAFO Scientific Council to assess fish stocks in the area, as well as ecosystem structure and interactions. Numerous NAFO documents and papers describe and analyze data from these surveys (e.g. NAFO 2010a, 2010b, 2011, 2012a, Perez-Rodriguez *et al.* 2011, 2012, Nogueira *et al.* 2013).
- While the SEA mentions the changes in areal coverage and gear in the DFO surveys referenced (page 161), it also indicates that 4 invertebrate species had passed its screening process – failing to recognize that only shrimp and crab have been consistently recorded in DFO surveys since the switch to the Campelen gear in 1995-1996. As such, it is actually impossible to establish if other invertebrates (e.g. brittle stars and/or sea urchins, among others) could have met or not the SEA screening criteria. It should be noted, however, that consistency in the recording of invertebrates in DFO surveys has been improved in recent years, and as part of the DFO Ecosystem Research Initiative (ERI) NEREUS Program during 2007-2010, a grab sampling program was implemented in soft bottoms of the Grand Bank (e.g. DFO 2012, Gilkinson 2012). These results should be included in the SEA.
- An incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species exists in the SEA. Over the last 5-7 years, there has been increased research effort devoted to the identification, characterization, and mapping of Vulnerable Marine Ecosystem (VME) indicator species within the SEA study area. Most of this work has been done under the umbrella of NAFO, and through the NAFO Scientific Council (SC) Working Group on Ecosystem Approaches to Fisheries Management (WGEAFM; recently been renamed SC Working Group on Ecosystem Science and Assessment (WGESA)). Most of this work is not included or mentioned in the current SEA. Furthermore, some recent and

relevant studies like Baillon *et al* (2012) and Beazley *et al* (2013) are referenced in the text, but absent in the references section, and some of their implications not included in the document. For example, Baillon's study documents the linkage between seapens (corals) and redfish larvae, and makes the case for seapen fields to be considered essential fish habitat for redfish. This potentially critical role of seapen fields for redfish is absent from Table 4.62 (overview of key groundfish species in the SEA area), and there is no mention of this linkage in Table 5.1. (fish and fish habitat potential environmental interactions).

- It should be noted that sponge grounds are among the more abundant VME indicator species in the SEA study area, but little attention is paid in Table 5.1. to the impacts of potential spills on these large grounds of filter-feeding, habitat forming species; and the spill simulations described in SEA seem to focus on either shoreline/surface impacts or highlights that spills will drift east (beyond 50°W). No attempt to assess the impact of these trajectories on VMEs exists in the current SEA, even though potentially damaging biogenic essential fish habitat could have serious long term impacts on ecosystem productivity.
- Although corals and sponges have been the initial focus in the study of VMEs, many other taxa have been identified as VME indicator species, including tube-dwelling anemones, erect bryozoans, and crinoids, and several physiographic features (e.g. seamounts, canyons, the Southeast shoal) have been identified as VME elements because they contain (or are likely to contain) VMEs (NAFO 2012). These other VME components are not discussed in any detail in the SEA, nor is an assessment of the potential impact of oil and gas exploration/production on them considered.
- Many of the NAFO reports from the Scientific Council meetings since 2008, and the reports from the SC WGEAFM (and references within) summarize most of the available information on VMEs in the SEA study area. These reports should be used not just to describe what is known on VMEs, but also to inform/construct scenarios for spill simulation studies.
- Although not yet available, the upcoming NAFO SC WGESA report (to be released in May 2014) will also contain an updated summary on VMEs, and an analysis of adequacy for current NAFO VME closures. This report will also contain recent findings that suggest that VME areas may be linked to higher fish densities, highlighting the potential importance of these areas for overall ecosystem production. Although it would have been impossible for the SEA drafting team to know these latest unpublished results when putting the SEA document together, the participation of NAFO within the SEA Working Group could have made them aware of this ongoing work, and possibly made available some of the preliminary results for the SEA drafting team.
- Another important source of information that would be useful for preparation of the final version of the SEA is the report of a Convention on Biological Diversity (CBD) Regional Workshop that took place in Montreal, on 24-28 March 2014 and was intended to facilitate the description of ecologically or biologically significant marine areas in the Northwest Atlantic. The international waters within the SEA study area were part of the area considered by this CBD workshop.

Section 4.2.1.3 – Plankton

- Plankton – The role of plankton in nitrogen and carbon cycling is not well explained. The term “biological pump” is misused. It does not refer to benthic pelagic coupling (which is an important process and should be explained) but rather to the sequestration of biogenic carbon in the deep ocean.

- The causal mechanisms of the spring bloom are incomplete. Onset of stratification and the interaction with light availability are key factors. Incorrect use of the term “biological pump” occurs in this section.

Section 4.2.1.4 – Plants and Microalgae

- Several important aspects of macroalgal communities are missing from the SEA. Several types of macroalgae, in particular coralline algae, have depth distributions well in excess of 30 m. Urchin-kelp-coralline algae dynamics are an important determinant of hard substrate communities in our waters (Himmelman and Steele, 1971). The substrate of the Grand Banks has been greatly disturbed by trawling which may affect the distribution of macroalgae. Fishing exclusion zones and artificial reefs may change this and provide refuges for macroalgae. Seaweed zonation with light is an important determinant of distribution. Seaweed communities are vulnerable to oil spills. Therefore coastal seaweed communities and their structure and function should be included in this section.

Section 4.2.1.5 – Benthic Communities

- All Gilkinson and Edinger (2009) citations should be Gilkinson and Edinger (eds.) (2009).
- As different types of benthic communities are sensitive to different types of disturbance, this should be discussed and summarized in a table for easy reference and decision-making.
- Regarding the statement, “...and DFO and NAFO RV surveys...“...visual assessments also poorly...” What is meant by ‘visual assessments’ here?
- Regarding the statement, “*It is also important to note that characterizations of benthic communities are also inevitably biased according to sampling method. For example, visual assessments often poorly assess infaunal communities whereas grabs may have challenges sampling communities over harder substrates.*” It should also be noted that bottom trawls typically sample only a small fraction of resident benthos, most often larger epibenthos.
- The statement, “*Collectively, these studies confirm that benthic communities in the SEA Study Area are quite diverse compared to higher trophic levels, as well as being somewhat sensitive to anthropogenic effects...*”, requires qualification. When speaking in terms of sand-dominated continental shelves, the global literature on fishing impacts in these habitats indicate that, in many cases, recovery can be relatively rapid (e.g. months). However, in deep-water slope environments inhabited by slow growing, long-lived corals and sponges, recovery could be measured in terms of decades in many cases, if not longer (Gilkinson and Edinger (eds.)(2009)).
- Further to the statement, “Perhaps the most holistic sampling was done on the Grand Banks as part of a series of trawling impact studies (Prena *et al* 1999; Kenchington *et al* 2001), it should be noted that these researchers used video and grabs (Kenchington *et al* 2001) and a benthic sled and trawl bycatch (Prena *et al* 1999)...”
- Table 4.58 – Some non-shellfish species (e.g., sea urchins, polychaetes, sponges etc.) are included in this table summarizing shellfish species.
- Table 4.58 – Regarding the statement, “*Spat settle primarily between August and November at depths of 10-15 m.*”, it should be noted that they also settle in deep offshore water, primarily gravel, on Grand Bank (Gilkinson and Gagnon, 1991).
- Table 4.58 – Information on ‘Pale Sea urchin’ should reference Gagnon and Gilkinson (1994).

- Table 4.58 – Information on ‘surf clam’ is incorrect. Surfclams (*Spisula solidissima*) are mostly confined to warmer waters, which on Grand Bank, is the Tail of the Bank and Southeast Shoal. The species that is harvested commercially north-east of this area is the Arctic surfclam, *Mactromeris polynyma*, with only sporadic occurrences of *S. solidissima*. Contact Elaine Hynick, Science Branch, DFO for more detailed information.
- Table 4.58 – Information on Polychaete worms, states that they occur on a variety of substrates. However, much of Grand Bank is comprised of sandy sediments which support abundant and diverse populations (documented by Kenchington *et al.*, 2001).
- The statement, “Studies to date indicate that, like fish, benthic assemblages respond to environmental variables such as depth, substrate and flow field (Houston and Haedrich 1984; Schneider *et al* 1987).”, requires addition of the following references related to Grand Banks benthos: Gilkinson and Gagnon, 1991; Gilkinson, 2013; Gale *et al.* (in press).
- Amphipod prey includes much more than just seaweed and phytoplankton. They have many diverse and ecologically important feeding modes. Many are scavengers and some are aggressive predators.
- Polychaete information is not comprehensive. The available literature should be used to provide data on diet and ecological roles of these important members of the benthos.
- The statement, “Collectively, sea pens, soft corals, stony corals, and sponges are represented across the shelf, slopes and banks of the Study Area but are found at their highest densities along the slopes, i.e. depths > 200 m.”, requires addition of references Wareham and Edinger (2007); Wareham (2010).
- The statement, “Sponges, in contrast are more widely distributed and high densities can be found along the eastern slopes of the Grand Banks, around the Flemish Cap and along the northern slopes of the SEA Area”, requires a reference.
- Regarding the statement, “In response to the known sensitivity of coral and sponge grounds, many a number of important coral and sponge areas have been designated as Vulnerable Marine Ecosystems (VMEs) (DFO 2012b) and are protected from damaging fishing activities in Canadian and NAFO waters..”, it should be noted that with the exception of a portion of the SW Grand Banks slope closure, these fishing closures occur in the NAFO regulatory area outside Canadian waters.
- Table 4.61 – The final column of this table is difficult to read. The number of digits after the decimal is inconsistent and the information is center justified, both of which are inappropriate formats for displaying such data. A right justified and constant number of digits after the decimal (suggested one digit past the decimal to be sufficient for “summary” statistics where precision is unwarranted).
- Figures 4.70 and 4.71 – The time period covered by the coral and sponge RV records should be stated in the figure titles.

Section 4.2.1.6 – Marine Fish

- Table 4.62 and 4.63 – Tables are listed alphabetically by species. The order of the species should be taxonomic to permit grouping of species into various logical ecological groups.
- Table 4.62 – There is a notable the lack of the most recent publications describing feeding habits and distribution and abundance trends of the three wolffish species found in the study area. The following references should be included in the descriptions for Atlantic Wolffish, Northern Wolffish, and Spotted Wolffish: Simpson *et al.* (2013); Collins *et al.* (2014).

- Table 4.62 – Atlantic Wolffish Habitat and Distribution – Wolffish are found over a variety of substrates (not just “hard clay bottom”), and at depths less than 25 m, and in excess of 250 m.
- Table 4.62 – That Atlantic Wolffish can be retained under SARA, unlike the other two wolffish species, deserves mention, even if this species is not “commercially significant”.
- Table 4.62 – Include fish species as an important component of Cusk diet (Bowman *et al.* 2000). Also include that Cusk is monotypic species in the Northwest Atlantic.
- Table 4.62 – The statement, “A number of research initiatives have also characterized benthic communities on the Grand Banks (Schneider *et al.* 1987; Kenchington *et al.* 2001)”, should include the following references Gilkinson, 2013; Gale *et al.* (in press). Gilkinson (2013) documents benthic communities over areas of Grand Bank as part of the DFO NL NEREUS Ecosystem Research Initiative, which involved a 3-year grab sampling program during multispecies trawl surveys. Gale *et al.* (in press) describe seastar (Asteroidea) assemblages and habitat use over wide areas of the eastern Canadian continental shelf and slope based on DFO survey trawl bycatch records and ROV video.
- Northern Wolffish – The statement “...occurs in Arctic seas on both sides of the North Atlantic Ocean” should be rewritten. Northern Wolffish occurs in both Arctic and Atlantic Oceans – as do other wolffish species, though no mention of this is made. The fact that Northern Wolffish is more pelagic than the other two species should also be noted.
- The statement that Northern Wolffish is distributed as a ‘widespread self-assemblage’, is incorrect. Northern Wolffish are mostly found along the shelf edge, not on the shelf.
- It should be included that, in the past, redfish larvae dominated the ichthyoplankton in many parts of the SEA area (Serebryakov *et al.* 1987).
- The introduction of invasive species and changes to habitat and/or community structure should also be discussed in the context of cumulative effects.
- The statement, “A total of four invertebrate taxa (snow crab, northern shrimp, pink striped shrimp, and shrimp *Pandalus propinquus*) were available from the Canadian Research Vessel surveys (Table 4.60)”, requires clarification. These are the major commercial spp., however many other non-commercial taxa have been processed using standardized protocols during RV surveys since 2005/2006. The point of availability is inaccurate.
- Roughhead Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic, only. A publication by Edinger *et al.* (2007) contains information on Roughhead Grenadier in NL waters. Specifically, it reports that Roughhead Grenadier were found in association with deep-sea corals, such as gorgonians, antipatharians, and soft corals, at depths of 200-1000 m.
- Roundnose Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic only. In the Northwest Atlantic, the species has been caught at depths less than 400 m. The data provided for NL comes from Parsons 1976. Newer information is available, in Power and Maddock Parsons (1998) and Kulka (2001). Most catches of this species occurred at depths of 900 m or more.
- Spotted Wolffish – Spawning in late autumn and early winter was suggested by Templeman 1966. A more recent publication (Templeman 1986) suggested mid to late summer spawning (July-August-Sept).
- White Hake – White Hake occur at depths much less than 200 m. On the western St. Pierre Bank, and southwest slope of the Grand Bank, they frequently occur at around 100 m (Han

and Kulka 2007). Juvenile White Hake are commonly found inshore, and may even occupy estuaries. Reference to Longfin Hake (*U. chesteri*) is not appropriate.

- White Hake – Not all juvenile White Hake are pelagic. The juvenile stage of the life cycle is characterized by pelagic and (later) demersal components.
- Winter Skate – Kelly and Hanson (2013) estimated that 40-70 egg cases are deposited each year. Also, cephalopods (squid) are an important component of the diet.
- Herring – The occurrence for this species has been recorded up to 450 m in multispecies surveys.
- Capelin – Capelin are found in 3NLOPs in spring RV survey. Include 3K and 2J from fall RV survey. Besides the RV trawl surveys, capelin distribution information is available from annual DFO acoustic surveys.
- The information related to ‘subsequently spent adults...’ is incorrect and wrongly cited. Spent females move out to deeper water after spawning on beaches/bottom sites. Those that survive eventually migrate to offshore feeding areas and likely aggregate with capelin that will be maturing and spawning next year. The timing, the route, and the mechanisms used to migrate from coastal waters to offshore feeding areas have not been knowingly documented.
- Include cephalopods as a major component of the Shortfin Mako diet.
- Include reproduction of White Sharks via internal fertilization, with development characterized by aplacental viviparity (also known as ovoviviparity) with embryonic oophagy. See Saïdi *et al.* 2005.
- Table 4.54 – Capelin spawning on Southeast Shoal takes place in June, July. Capelin also spawn on the bottom in coastal waters.
- Table 4.54 – Capelin spawning time (cumulatively) on beaches and coastal bottom sites and the Southeast Shoal encompasses May, June, July, August.
- Table 4.54 – No corresponding footnote reference exists for superscript #4.
- Table 4.54 – Sandlance spawning season is winter (December-March) not June–August as indicated in the table.
- Table 4.65 – There is much accompanying text around this table related to the inflated representation introduced by comparing numbers among various body sizes (e.g., cod versus sand lance). Agreed this is important – suggested to add a Table be added as a companion table which reports not numbers, but rather weight of catch by species reflecting the biomass of the various species in the SEA area.
- Sandlance – Table 4.65 states Sandlance constitute 6% of RV catch while the text states they constitute 30%.
- Sandlance – The report should include information regarding habitat usage of Sandlance, i.e., burrowing in substrate part of day; migrating vertically to feed; and no distance migrations as are closely associated with their habitat.
- Sandlance – It should be noted that inshore and offshore sandlance are two different species. The report should highlight which species is impacted by any proposed work.

- Atlantic Cod – Other than a line in one of the tables in this section of the report, there is no mention of Atlantic cod, despite the existence of a published Atlantic cod Recovery Potential Assessment in 2011 (DFO-CSAS).

Section 4.2.1.8 – Environmental Influence and Changes

- This section does provide useful information on climate change on fish and invertebrates; however, the context needs to be improved with the addition of information of the role of the North Atlantic Oscillation (NAO) and more comprehensive text on climate change generally (either in the existing text or earlier in sections on the physical environmental setting).

Section 4.2.1.9 – Aquatic Invasive Species

- Table 4.67 – Green crab is also one of the few AIS which are known to destroy fish habitat (i.e., eelgrass), thereby affecting recruitment of some species (e.g., Morris et al 2010).

Section 4.2.1.10 – Ecologically and Biologically Significant Species (EBSAs)

- The recent identification and description of additional EBSAs in the NL Shelves area (DFO 2013) has not been incorporated into this report. The data layers for these EBSAs can be provided upon request. Notably, The Orphan Spur EBSA, and possibly the edge of the Notre Dame Channel EBSA, overlap with the study area.
- Ecologically and Biologically Significant Areas (EBSAs) – *Southeast Shoal and Tail of the Banks*: It should also be noted here that the Southeast Shoal is an area with some of the highest (if not the highest) benthic biomasses recorded anywhere in the world due to the standing biomass of populations of the Arctic wedge clam, *Mesodesma* sp.
- Figure 4.89 – It is unnecessary for EBSAs outside the Eastern NL SEA boundaries to be included.

Section 4.2.1.11 – Other Ecologically Important Areas

- Figure 4.90 – Ecologically Important Areas Identified in the Orphan Basin SEA (2003). The color designation for the Orphan Basin area should be a darker shade to differentiate from the surrounding area.
- Legends provide a color scheme for abundance/biomass/species richness in Figures 4.91-4.93. It is not indicated how these were derived. No units are shown.

Section 4.2.3 – Marine Mammals and Sea Turtles

Given the objectives of the SEA, the document is generally well written as it pertains to marine mammals.

- The information on Pinnepeds (Section 4.2.3.3) needs to be expanded so that harp seals, hood seals and grey seals are treated separately in the summary table (i.e. in the same manner key whale species were addressed). Although there are similarities in the ecology of harps and hoods, there are enough differences that lumping both species together results in a summary table with content that is too general to be useful. The timing and use of ice habitat for whelping needs to be a focus for each of these two species. There is also a climate change aspect that should be presented and discussed (there is published literature on this topic as well as new information becoming available pers. comm. Garry Stenson). Note that a recent publication on satellite movements of hooded seals indicates that there is significant feeding along the shelf edge to the east of the 'Northeast Shelf Slope' EBSA (Anderson *et al.* 2012).

- Note that there are likely harbour seals present along the southern shore of the Avalon Peninsula for most of the year in addition to the Bays along the south coast. Also, note that this March the Convention on Biological Diversity conducted a science advisory workshop to delineate EBSAs in the Northwest Atlantic Area beyond the 200mile limit. One area that was identified was the shelf break area from the Lilly/Carson Canyon area extending northward to 48° N.

Section 4.3 – Human Activities (4.3.4 Marine Fisheries)

An incomplete (and potentially misleading) description of fishing activities exists in the SEA. Virtually the entire section related to marine fisheries within the current SEA is constructed on the basis of Canadian fisheries, or foreign fisheries which land their catches in Canadian ports. This view of the fishing activities that take place in the SEA study area is limited and incomplete. The entire section related to this topic suggests a distribution of fishing activities that omits entirely the international fisheries operating outside the EEZ managed by NAFO, and therefore most of the maps could mislead an uninformed reader to believe, for example, that there is essentially no fishing going on in the Flemish Cap, or that the Sackville Spur has no fishing whatsoever, when in reality this is one of the areas in the region that has the highest levels of fishing effort (e.g. NAFO 2012a).

Explicitly, it is not implied that these omissions and shortcomings are intentional, but it is highlighted that they effectively render the entire analysis of marine fisheries useless. The SEA states, *“Although the DFO datasets are known not to be comprehensive, particularly with regard to important inshore fisheries, the information provides a useful regional picture of fishing activity in the area that is considered adequate and appropriate for the purposes of the SEA”*. However, this cannot be assumed true. Offshore, without integrating the information from Canadian and international fisheries it is impossible to assess if the picture provided is adequate and appropriate. As such, the entire section on marine fisheries should be redone to incorporate international fishing effort data. These data, in aggregated format, could be requested from the NAFO Secretariat. Note also that Campbell and Feridzon (2013) provide data for fishing vessel activity in the areas governed by NAFO for 2011 and 2012.

To permit a general visual comparison of fisheries activities in the study area with and without inclusion of NAFO data, see Figure 1; Appendix 1 that compares Figure 4.122 from the SEA report (commercial fishing locations in 2008-2012) and Figure 4.2.2.1.7 from NAFO (2012a) (common fishing effort areas derived from VMS data in 2008-2011). Such information should be combined with the fishing effort information from DFO to provide a complete picture of fishing in the SEA area.

Section 5 – Environmental Interactions, Mitigation and Planning Considerations

In general, with regards to environmental interactions, mitigation and planning considerations, the report presents an overview of some of the possible interrelationships resulting from potential offshore oil and gas activities on the Grand Bank and adjacent areas (e.g., Table 5.1) by listing the major activities related to seismic surveys, exploration, drilling and production activities, and how these activities might potentially impact fish and fish habitat, while considering results from previous studies and other sources of available information. However, some areas remain vague in this regard, as do many of the environmental mitigation measures.

Section 5.1 – Fish and Fish habitat (effects assessment)

- This section is a weak summary of other summaries. It is not comprehensive and will not serve as a useful reference. Our understanding has changed dramatically with the research following the Macondo blowout. This should be reflected in this summary.

- Table 5.1 – Information in the table is not adequate. The table is incomplete and often cites reviews of reviews. It is noted in the header that the table is a “Summary of Some Known and Potential Environmental Effects Based on Available Information Sources”. This implies that a thorough job of reviewing and summarizing the existing literature for this aspect of the report was not undertaken.
- Table 5.1 – It should be noted that accidental spills of oils or other substances onto the Southeast Shoal during the period capelin are spawning, eggs are incubating, and yolk sac larvae are in the sediment could have a negative impact on that year class and subsequent spawning biomass.
- The bullet, “Changes in the presence, abundance, distribution and/or health of fish and invertebrates...” is vague. Direct mortality of marine organisms (at various stages of development) resulting from exposure to oil pills should be stated explicitly instead.
- Produced water effects should include increased nutrient loading and the ecosystem consequences for benthic pelagic coupling and production (Rivkin *et al.* 2000).
- Tannen *et al.* (2nd line) is cited incorrectly. The effects found relate to increased oxygen demand not oxygen enrichment. Produced water effects in this section are related to discharge not flaring. Rye *et al.* (2003) is not in the list of references.
- Mitigations for ballast water introduction of invasive species are included, but not for fouling organisms on hulls, drilling rigs or equipment. Protocols for mitigation of these introduction vectors should also be included in this section.
- It is indicated that the Southeast Shoal is a nursery for yellowtail flounder. However, it should also be acknowledged that the Southeast Shoal is the only spawning site for the Southeast Shoal capelin stock.
- The report suggests as a mitigation procedure ‘*avoiding species at risk where possible during the planning and conduction of oil and gas activities in the offshore*’. However, since the three wolffish species are found throughout the study area, no practical avoidance exists. What should be a practical mitigation measure in the case of wolffish or white sharks?
- There are no considerations in the report regarding accidental oil spills vis-à-vis fish species at risk and their habitat. This study includes the spatial distribution of abundance indices for the three wolffish species; and potential spatial and temporal trajectories of oil spills have been modelled and/or simulated in previous studies (e.g. Net Environmental Benefit Analysis of Dispersant Use for Responding to Oil Spills from Oil and Gas Facilities on the Newfoundland Grand Banks, 2013); both sources of information could be used to assess the impact of oil spills on the wolffish populations components found in the study area and could also be used as a framework for identifying appropriate mitigation measures in the case of oil spills.

Section 5.3 – Marine Mammals and Sea Turtles (Effects Assessment)

This section of the document is generally well written as it pertains to marine mammals given the objectives of the SEA. However, it is noted the sections on Important Areas and Times for each of the key VEC species groups (e.g. Marine Mammals and Sea Turtles - 5.3.3.2) have considerable repetition from earlier sections of text. While some of this is warranted, there should also be an effort to link this information with the appropriate mitigation measures presented in each of the preceding sections of text.

- The risk from ingestion of floating debris (i.e. plastic bags) for turtles should be discussed and garbage management and on shore disposal proposed as mitigations.

Section 5.4 – Sensitive and Special Areas (Effects Assessment)

- The effects of drilling wastes on sensitive and sessile benthic species such as corals and sponges is not well understood. However, since they are filter feeders and known to be sensitive to increased sedimentation, organic matter loading and quality of suspended particulate material it can anticipated that they will be negatively affected. There is also very little information on the potential effects of seismic exploration on these organisms. These aspects should be highlighted as a critical information gap within this consideration of sensitive and special areas.
- The mitigation for cumulative effects is to reduce overlap of projects. This is not realistic. Overall this section is inadequate and does not summarize or address the potential for cumulative effects. It should include interactions between activities as well as thresholds for effects and consider climate, habitat and foodweb change as possible drivers.
- This section implies that only designated VMEs and Coral Areas will be considered in this section. Other coral and sponge populations are only briefly referred to in the ecosystem overview and generally ignored in the assessment of potential effects.

Section 5.6 – Cumulative Environmental Effects

This section is very superficial as presented. It is noted within the report that information on cumulative effects is undeveloped here because upcoming projects and their footprints are unknown. However, there is there is also no attempt to describe how cumulative effects are currently being assessed nor is there acknowledgment and discussion regarding the advancements in cumulative effects research in recent years. These issues need to be addressed.

Specifically regarding the issue of unknown projects and unknown project footprint sizes as an explanation for providing no relevant industry information, it is noted that it is indicated elsewhere in the current SEA and on the C-NLOPB website that up to ten Environmental Assessments for petroleum exploration/production activities are in progress. At the very least, an overview and time line of these activities should be presented here.

Note: DFO conducted a National Science Advisory Process to develop a new framework for large project cumulative effects on marine mammals in March 2014 – contact J. Lawson for details on when this information will become available.

Section 5.7 Information Availability, Requirements and Opportunities

Coral and sponge effects and sensitivity should be identified as a significant information gap.

Section 6 – Summary and Conclusions

Page 444 – Regarding the “**C-NLOPB Note: Recommendations and conclusions regarding the issuance of rights and any requirement on the restriction of offshore oil and gas activities in the SEA Study Area will be finalized for inclusion in the Eastern Newfoundland SEA Report following the conclusion of the regulatory and public comment period.**”, It is not clear what this note means. Does it mean that if DFO/NAFO wants to extend the closure of the coral and sponge VMEs to other human activities that CNLOPB will include this in the SEA?

CONCLUSION

In conclusion, the quality of scientific content presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the document can be considered a reliable source of guidance for policy and management decision-making.

Contributors

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D. Richards	DFO Science, NL Region

Approved by

Barry McCallum
Regional Director of Science
DFO, Newfoundland and Labrador Region

April 16, 2014

Sources of information

This Science Response Report results from the Science Response Process of April 2014 for the Science Review of the Eastern Newfoundland Strategic Environmental Assessment (SEA).

Additional publications from this meeting will be posted on the [\(DFO\) Science Advisory Schedule](#) as they become available.

Andersen, J. *et al.* 2012. Habitat selection by hooded seals in the Northwest Atlantic Ocean. ICES J of Marine Science.

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Appendix 1: Figures

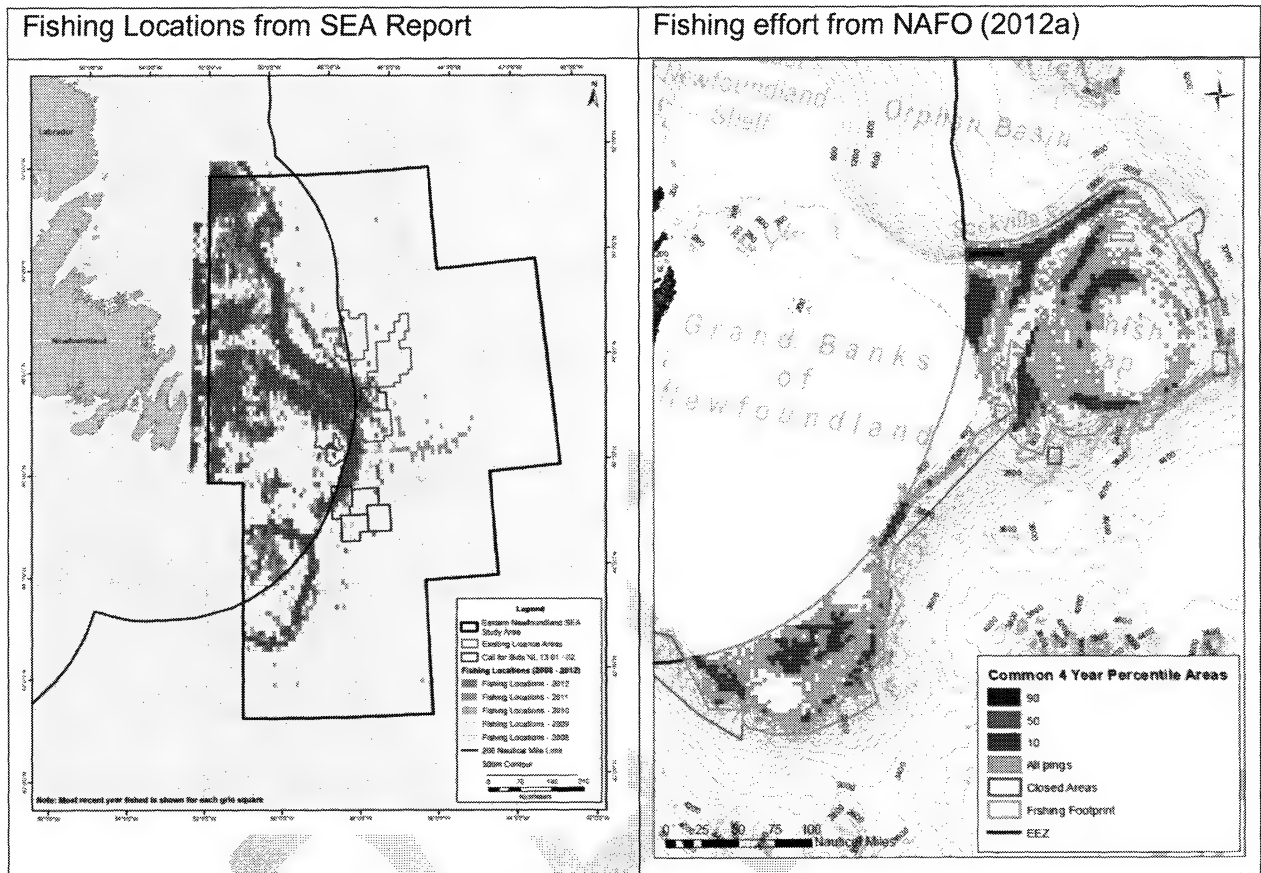


Figure 1. Comparison of Fishing Locations mapping from the Eastern Newfoundland SEA (Figure 4.122 from the SEA report- commercial fishing locations in 2008-2012-) and common fishing effort areas in the NAFO Regulatory Area in 2008-2011 derived from NAFO VMS data (Figure 4.2.2.1.7 from NAFO (2012a)).

This Report is Available from the

Center for Science Advice (CSA)
Newfoundland and Labrador Region
Fisheries and Oceans Canada
PO Box 5667
St. John's, NL A1C 5X1

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ISSN 1919-3769

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Correct Citation for this Publication:

DFO. 2014. Update of Stock Status Indicators for Northern Shrimp, *Pandalus borealis*, in Shrimp Fishing Areas 4, 5 and 6. DFO Can. Sci. Advis. Sec. Sci. Resp. 2014/nnn.

Aussi disponible en français :

MPO. 2014. Mise à jour des indicateurs de l'état du stock pour la crevette nordique (*Pandalus borealis*) dans les zones de pêche de la crevette 4, 5 et 6. Secr. can. de consult. sci. du MPO, Rép. des Sci. 2014/nnn.

Templeman, Nadine

From: Sjare, Becky
Sent: April-16-14 11:48 AM
To: Templeman, Nadine
Subject: Templeman_ Eastern Newfoundland (SEA) Draft - DRAFT Science Response_Sjare
Importance: High

Hi Nadine,

Here are some inserts and minor edits for my sections. Will try and pop after lunch.

Becky



CSAS_2014_Eastern
Newfoundland...

From: Templeman, Nadine
Sent: April 14, 2014 12:46 PM
To: Anderson, M. Robin; Gregory, Robert; Koen-Alonso, Mariano; Wells, Nadine; Gilkinson, Kent; Sjare, Becky; Bourne, Christina M; Mowbray, Fran; Simpson, Mark R
Cc: Templeman, Nadine; Richards, Dale E; Mansour, Atef A H
Subject: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review
Importance: High

Good day everyone,

Please note, as you may have anticipated, the feedback from the Science review of the Draft Eastern Newfoundland Strategic Environmental Assessment (SEA) is now being moved over to a formal Science Response Process. Also note that I will be taking over this file from Dale from this point on.

This last minute change in approach is in light of a short (although much needed) extension granted to Science Branch by the CNLOPB late last week in order for DFO to collate significant feedback received from its review. As it was Science Branch original desire to undertake a formal process for communicating the feedback from this review, we have decided that the extra couple of days will now allow us the time needed to convert the collated response from its original Memo format to draft a Science Response as the vehicle to communicate Science review/feedback. This advice will now be accessible to the public via the CSAS website upon completion. This is important given the significant feedback you all provided.

Due to tight timelines, I am proposing the use of email as opposed to a face to face meeting to review the draft Science Response. Please review the draft Science Response attached, noting whether your views were incorporated appropriately, and the whether you are comfortable with the conclusions provided. Feedback will be appreciated via email and/or tracked changes at your earliest convenience to the deadline of **12 NOON, Wednesday, April 16.** Albeit

short, this deadline will allow time to determine if there are any significant issues that need to be addressed prior to finalizing the Science Response for RDS approval and subsequent submission to FPP on the agreed-upon deadline of Thursday, April 17.

Any questions, please email for the time being (or come see me) as I have moved into what was Krystine's old office and am currently without a phone line.

Thanks again, and cheers,

<< File: CSAS SRR 2014_nnn Eastern Newfoundland SEA (Draft for Review).docx >>

Nadine.

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From: Richards, Dale E

Sent: March 7, 2014 3:40 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason; Sooley, Darrin; Wells, Nadine; Nakashima, Brian; Hamoutene, Dounia

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments April 2, 2014

Importance: High

Good afternoon,

Following several delays, the 'Draft' Eastern Newfoundland SEA has finally been posted on the CLNOPB website. It can be accessed at the following link: <http://www.cnlopb.nl.ca/enlsea.shtml>. The full SEA document along with the associated SEA appendices have also been posted on the shared Science drive under the Science folder: Science Info/CSA Review/ Habitat/ SEA & EA/ Eastern NL SEA March 2014 request. Please note that I have not removed the 'Eastern NL SEA December 2013' files from the shared folder by chance that someone wishes to compare the two draft versions. However, if you have not commenced your review please be sure to use to the most recent version of these SEA files.

To date I have received a few submissions pertaining to this request and this content will be included in the Science response memo. To those Sections that still intend on sending along comments or additional revisions the CSA Office will require such submissions by **April 2nd**.

Listed below are specific Sections of the EA Report which require Science review:

Environmental Setting

- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Sensitive and Special Areas (note revised title)
-

Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
- Section 5.3 – Marine Mammals and Sea Turtles (including Species at Risk and Other Key Species)
- Section 5.4 – Sensitive and Special Areas (note revised title)

Please give me a call if you have any questions on this process.

Thank you,
Dale

From: Richards, Dale E

Sent: January 31, 2014 1:47 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

Good afternoon,

There has been a further delay in the submission of the Eastern Newfoundland SEA for review. The latest I have received from the FPP (via the CLNOPB) is that the 'final' draft report will be made available to us for review the end of February. I will continue to keep you updated as CSA receives any information.

Dale

From: Richards, Dale E

Sent: January 7, 2014 12:59 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert

Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason

Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Previous Deadline for comments January 20, 2014 - Extension forthcoming

The CLNOPB has advised that the submission of the 'final' draft report - Eastern Newfoundland SEA - to FPP will be delayed until the end of January. This 'final' draft will be an update to the 'preliminary' Draft #1 version

highlighted in the e-mail below and posted on the Science shared drive prior to the Christmas break. Based on this information, we know that an extension on this request for advice will be forthcoming. Thus, it may be advisable to delay your review of the preliminary draft of the SEA report until the final draft becomes available.

As soon as the CSA Unit receives an update from FPP, I will send out a revised deadline to this request. At this point, a 3-week delay to obtain the 'final' draft SEA is anticipated.

Please give me a call if you have any questions on this process.

Thank you,
Dale

From: Richards, Dale E
Sent: December 23, 2013 4:56 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry; Kelly, Jason
Subject: RE: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comments January 20, 2014

Good afternoon,

In consultation with the RDS-Office, the CSA Unit has decided that based on the timing of this request and the draft nature of the Eastern Newfoundland SEA report that this request for advice will be provided to Ecosystems Management via a memo. i.e. there will be no formal Science meeting or SSRP process at this time. To that end, comments on the SEA report will be needed by the CSA office by **Monday, January 20th**. This will allow the CSA Unit a few days to compile the comments.

Section heads, please ensure that this request and deadline is sent to the appropriate scientist within your section. For your reference, the original e-mail is provided below.

If you have any questions, please let me know.

Thank you,
Dale

From: Richards, Dale E
Sent: December 2, 2013 2:19 PM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan
Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry
Subject: Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1 - Deadline for comment mid-January 2014 - Please action

Good afternoon,

CSA has received, from the FPP (via the C-NLOPB) for review, the Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft #1.

DFO is providing expert advice, to support the C-NLOPB, on baseline conditions (i.e. environmental setting) and mitigations related to potential impacts of oil and gas activities on fish, fish resources, SAR, sensitive areas and DFO research activities.

To provide context related to the SEA process please see Section 2: SEA - Scope and Approach.

The Science review should focus on whether the baseline information is accurate and that the effects assessment, taking into consideration departmental guidance such as the "Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment"

Listed below are specific Sections of the EA Report which require Science review and comments:

Environmental Setting

- Section 4.1.4 – Oceanography
- Section 4.1.5 – Ice conditions
- Section 4.2.1 – Fish and Fish Habitat
- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Protected and Other Designated Sensitive Areas
-

Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
- Section 5.3 – Marine Mammals and Sea Turtles (including Species at Risk and Other Key Species)
- Section 5.4 – Sensitive Areas

The FPP has requested that Science provide comments by the end of January. In the interim, until a Branch decision has been made on how this request for advice is going to be handled (i.e. memo or SSRP process), I have placed the SEA report on the shared drive in the '**CSA Review**' folder, subfolder '**Eastern Newfoundland SEA - December 2013 Request**'. This will allow the maximum time available to Science to review and provide comment on the report. Whether a SSRP process takes place or a memo is formulated, I suspect that comments will be required from individual scientists by **mid-January 2014**. I will be in touch at a later date regarding specific deadlines and what format this request for advice will take.

As always, if you have any questions please let me know. Section heads, please ensure that this request is sent to the appropriate scientist within your section.

Thank you,
Dale

E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

Newfoundland and Labrador Region / La Région de Terre-Neuve et du Labrador

Fisheries and Oceans Canada / Pêches et Océans Canada

80 East White Hills Road, PO Box 5667, St. John's, NL A1C 5X1

Tel: (709) 772-8892

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E-mail / Courriel: Dale.E.Richards@dfo-mpo.gc.ca

Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO

<http://www.dfo-mpo.gc.ca/csas-sccs/>

Templeman, Nadine

From: Anderson, M. Robin
Sent: April-16-14 1:54 PM
To: Templeman, Nadine
Cc: Clarke, Keith
Subject: RE: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review

Hi Nadine,

I've read through the document and found that it accurately reflects my concerns. All concerns are clearly presented and the document provides a very thorough review. [REDACTED]

Cheers,

Robin

M. Robin Anderson, PhD
Marine Habitat Research Scientist
Ecological Sciences Section
Environmental Science Division
Science Branch, Fisheries and Oceans Canada
POBox 5667
St. John's, NL A1C 5X1
CANADA
ph: 709-772-0460
fax: 709-772-5315
email: m.robin.anderson@dfo-mpo.gc.ca

From: Templeman, Nadine
Sent: April-14-14 12:46 PM
To: Anderson, M. Robin; Gregory, Robert; Koen-Alonso, Mariano; Wells, Nadine; Gilkinson, Kent; Sjare, Becky; Bourne, Christina M; Mowbray, Fran; Simpson, Mark R
Cc: Templeman, Nadine; Richards, Dale E; Mansour, Atef A H
Subject: Eastern Newfoundland (SEA) Draft - DRAFT Science Response - For your Review
Importance: High

Good day everyone,

Please note, as you may have anticipated, the feedback from the Science review of the Draft Eastern Newfoundland Strategic Environmental Assessment (SEA) is now being moved over to a formal Science Response Process. Also note that I will be taking over this file from Dale from this point on.

This last minute change in approach is in light of a short (although much needed) extension granted to Science Branch by the CNLOPB late last week in order for DFO to collate significant feedback received from its review. As it was Science Branch original desire to undertake a formal process for communicating the feedback from this review, we have decided that the extra couple of days will now allow us the time needed to convert the collated response from its original Memo format to draft a Science Response as the vehicle to communicate Science review/feedback. This advice will now be accessible to the public via the CSAS website upon completion. This is important given the significant feedback you all provided.

Due to tight timelines, I am proposing the use of email as opposed to a face to face meeting to review the draft Science Response. Please review the draft Science Response attached, noting whether your views were incorporated

appropriately, and the whether you are comfortable with the conclusions provided. Feedback will be appreciated via email and/or tracked changes at your earliest convenience to the deadline of **12 NOON, Wednesday, April 16**. Albeit short, this deadline will allow time to determine if there are any significant issues that need to be addressed prior to finalizing the Science Response for RDS approval and subsequent submission to FPP on the agreed-upon deadline of Thursday, April 17.

Any questions, please email for the time being (or come see me) as I have moved into what was Krystine's old office and am currently without a phone line.

Thanks again, and cheers,

<< File: CSAS SRR 2014_nnn Eastern Newfoundland SEA (Draft for Review).docx >>

Nadine.

Nadine Templeman, B.Sc., M.Env.Sci.
Science Advisor/Coordinator/ Conseiller/Coordinateur Scientifique
Centre for Science Advice/ Centre pour le conseil de Science
Science Branch / Direction des sciences
Fisheries and Oceans Canada / Pêches et Océans Canada
P. O. Box 5667 / C. P. 5667
St. John's, NL / St. John's, Terre-Neuve
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Telephone / Téléphone: (709)772-3688
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E-mail / E-mail: nadine.templeman@dfo-mpo.gc.ca

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Sent: March 7, 2014 3:40 PM

To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Grant, Carole; Stansbury, Don; Parsons, Dawn; Shelton, Peter; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan; Gregory, Robert; Wells, Nadine

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Subject: RE: UPDATE Eastern Newfoundland Strategic Environmental Assessment (SEA) Draft - Deadline for comments April 2, 2014

Importance: High

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To date I have received a few submissions pertaining to this request and this content will be included in the Science response memo. To those Sections that still intend on sending along comments or additional revisions the CSA Office will require such submissions by **April 2nd**.

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Please give me a call if you have any questions on this process.

Thank you,
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Cc: Mansour, Atef A H; Meade, James; Templeman, Nadine; Parrill, Erika; Davis, Ben; McCallum, Barry

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Good afternoon,

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To provide context related to the SEA process please see Section 2: SEA - Scope and Approach.

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- Section 4.2.3 – Marine Mammals and Sea Turtles
- Section 4.2.4 - Protected and Other Designated Sensitive Areas

Environmental Interactions, Mitigation and Planning Considerations (effects assessment)

- Section 5.1 – Fish and Fish habitat (including Species at Risk and Other Key Species)
- Section 5.3 – Marine Mammals and Sea Turtles (including Species at Risk and Other Key Species)
- Section 5.4 – Sensitive Areas

The FPP has requested that Science provide comments by the end of January. In the interim, until a Branch decision has been made on how this request for advice is going to be handled (i.e. memo or SSRP process), I have placed the SEA report on the shared drive in the '**CSA Review**' folder, subfolder '**Eastern Newfoundland SEA - December 2013 Request**'. This will allow the maximum time available to Science to review and provide comment on the report. Whether a SSRP process takes place or a memo is formulated, I suspect that comments will be required from individual scientists by **mid-January 2014**. I will be in touch at a later date regarding specific deadlines and what format this request for advice will take.

As always, if you have any questions please let me know. Section heads, please ensure that this request is sent to the appropriate scientist within your section.

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E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

Newfoundland and Labrador Region / La Région de Terre-Neuve et du Labrador

Fisheries and Oceans Canada / Pêches et Océans Canada

80 East White Hills Road, PO Box 5667, St. John's, NL A1C 5X1

Tel: (709) 772-8892

Fax/ Télécopieur: (709) 772-6100

E-mail / Courriel: Dale.E.Richards@dfo-mpo.gc.ca

Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO

<http://www.dfo-mpo.gc.ca/csas-sccs/>

Richards, Dale E

De: Templeman, Nadine
Envoyé: April-22-14 10:45 AM
À: Sooley, Darrin
Cc: Richards, Dale E; Templeman, Nadine
Objet: RE: Review of East NL Strategic Environmental Assessment

Hi Darrin,

As agreed, attached is the DRAFT SRP that is currently with the RDS for approval. Please feel free to work with this document until which point I have advised that it has been approved (and will advise of any (unlikely) changes at that time). I expect the OK by later today or tomorrow.

Thank you very much again for allowing us the additional time to incorporate the significant feedback we acquired during our review.

Much appreciated,



CSAS SRR
2014_nnn Easter...

Nadine.

Nadine Templeman, B.Sc., M.Env.Sci.
Science Advisor/Coordinator/ Conseiller/Coordinateur Scientifique
Centre for Science Advice/ Centre pour le conseil de Science
Science Branch / Direction des sciences
Fisheries and Oceans Canada / Pêches et Océans Canada
P. O. Box 5667 / C. P. 5667
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Facsimile / Télécopieur: (709)772-5315
E-mail / E-mail: nadine.templeman@dfo-mpo.gc.ca

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From: Sooley, Darrin
Sent: April 11, 2014 2:52 PM
To: Richards, Dale E; Templeman, Nadine
Subject: Review of East NL Strategic Environmental Assessment

Hello Dale and Nadine:

Further to our discussion yesterday please note that I received response from CNLOPB that the timeframe for provision of our response can be extended by a week or so which will allow you to provide consolidated Science comments as discussed by late next week or early week of April 21.

If any questions please let me know.

Regards,

Darrin R. Sooley

Senior Fisheries Protection Biologist – Marine, Coastal, Oil and Gas Development

Fisheries Protection and Regulatory Reviews

Ecosystems Management Branch

Fisheries and Oceans Canada – NL Region

P.O. Box 5667 St. John's NL A1C 5X1

Phone: 709.772.3521 (Office) 709.685.7249 (Cellular)

Fax: 709.772.5562

Email: darrin.sooley@dfo-mpo.gc.ca

SCIENCE REVIEW OF THE EASTERN NEWFOUNDLAND STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

Context

Since 2002, the C-NLOPB has been conducting Strategic Environmental Assessments (SEAs) of portions of the Newfoundland and Labrador Offshore Area that may have the potential for offshore oil and gas exploration activity. SEA is a broad-based approach to environmental assessment that examines the environmental effects which may be associated with a plan, program or policy proposal and that allows for the incorporation of environmental considerations at the earliest stages of program planning. SEA typically involves a broader-scale environmental assessment (EA) that considers the larger ecological setting, rather than a project-specific environmental assessment that focuses on site-specific issues with defined boundaries. Notably, the accuracy of information in a SEA is especially important as it sets the basis for future project-specific EA within its study area.

On March 5, 2014, The Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) released the [Draft Eastern Newfoundland Strategic Environmental Assessment \(SEA\) Report](#) for public comment.

The Environmental Assessment and Major Projects (EAMP) Division of the DFO Ecosystems Management Branch in the Newfoundland and Labrador Region requested that DFO Science undertake a review of this document, and specifically the information put forward in the SEA on the (physical and biological) Environmental Setting: Section 4.1.4 (Oceanography); Section 4.1.5 (Ice conditions); Section 4.2.1 (Fish and Fish Habitat); Section 4.2.3 (Marine Mammals and Sea Turtles); Section 4.2.4 (Sensitive and Special Areas); as well as that on Environmental Interactions, Mitigation and Planning Considerations (i.e., the effects assessment): Section 5.1 (Fish and Fish Habitat); Section 5.3 (Marine Mammals and Sea Turtles); and Section 5.4 (Sensitive and Special Areas).

Given the short timeline to carry out a review, a DFO Science Response process was undertaken. Science expertise within Fisheries and Oceans, Newfoundland and Labrador Region was solicited to address this review – although the provision of feedback was limited to the areas of the report where expertise was available at the time of the review, including that from Ecological Sciences, Marine Mammals, Marine Fish Species at Risk and Pelagic Sections.

The review found that overall the quality of scientific information presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the final document can be considered a reliable source of guidance for policy and management decision-making.

This Science Response Report results from the April 2014 Science Response Process for the review of the “*Eastern Newfoundland Strategic Environmental Assessment (SEA)* (AMEC November 2013).” The report is a summarization of the comments provided by DFO Science Branch, Newfoundland and Labrador Region, to the Marine Habitat Protection Section on the above noted sections, as well as other parts of the document with appropriate linkages to those.

Analysis and Response

General Comments

- As the *Eastern Newfoundland Strategic Environmental Assessment* is intended to identify and incorporate environmental considerations at the earliest stages of planning and decision making, it is expected to be broad in its scope, and relatively general in its description of potential impacts associated with oil and gas exploration and/or production in the region within the next decade. However, specific details still remain important in many regards as it is fundamental that the SEA provides a complete and comprehensive system-wide perspective in order to be useful for future project-specific EAs.
- Much of the information describing the existing environment is reasonably complete for the area of the SEA that falls inside the 200 mile limit. However, specific information for the offshore (>200 miles) portion of the study area, and in particular the Flemish Cap and Orphan Basin, is lacking. This is largely attributable to lack of consideration of fishing and research data from NAFO sources and is considered a major weakness in the accuracy of the assessment.
- The SEA is lacking a comprehensive overview on climate change in its description of the physical environment. Only a few statements regarding climate change exist throughout, with nothing substantive reported. Information taken from existing models and the most current projections should be presented for key physical indices where available.
- The SEA does not adequately capture the complexity of the biological environment of the study area. The report does not describe functional ecosystem units or attempt to analyze impacts on their structure and function; but rather simply provides a list of components and compiles potential effects on them, as opposed to on the system as a whole. While this type of description is useful, it is not complete, and carries the risk of promoting “tunnel vision” approaches to management issues.
- The SEA is lacking in its consideration of important aspects of the ecosystem such as trophic structure, ecoregion configuration, linkages between the Grand Bank and the northern Newfoundland shelf, and bottom up regulation of ecosystem productivity – all of which are key to understanding the existing environment and potential interactions.
- The SEA provides incomplete descriptions of Vulnerable Marine Ecosystems (VMEs), and is lacking adequate information for characterization of VME indicator species, including their distribution and the potential impacts of oil and gas exploration/production and spills on these.
- The SEA consideration of potential environmental effects is basic at best, failing to synthesize the current understanding of potential effects. This is also the case for the sections on interactions with other human activities including fishing and sensitive and special areas. The potential for cumulative effects is mentioned in the report, but is not developed.
- The SEA contains data sets that appear to be dated (e.g., DFO fish survey data up to 2009; Sea Ice Atlas to 2010; some tropical storm data to 2000; MSC50 wave/current data to 2011; etc.) While it is understandable that some data sets may not be available after a certain date; it is, however, likely that some are available in an updated format (e.g., the most recent tropical storm data). As such, if a data set is ‘prematurely’ truncated or not being used for some reason – it should be stated within the report and clarification provided. Also, if there are additional data expected, it should be noted when they are likely to become available.

Specific Comments

Section 3.2 – Generic Description of Offshore Oil and Gas Activities

- Primary emissions from offshore production should explicitly list produced water since it is the largest waste stream from that activity.
- Spill data for NL offshore should be updated to include 2013. Spill discussion should also include that spills may be due to aging or leaky infrastructure.
- Oils spills scenarios under ice should be included in tables where available. Although they are mentioned as part of some of the studies, inclusion in the tables would prove useful.
- Table 3.4 – Numbers are not standardized per unit time or capacity; therefore, they are misleading. What are the “lifespans” of the wells in this table – i.e., how many of the 29,527 wells in the 1980’s were also operational in the 1970’s (and hence double counted)? The total number operating during each period may reduce the apparent blowout frequency by referencing existence in more than one of the time periods. The number of operating wells in 1971-80 plus the number of “new wells” minus the number of “decommissioned wells” would be a more meaningful number in this column in this comparison. The number of exploration vs. production wells would be very revealing also. It is suggested that revising the blowout instances per unit time of well operational life would be more informative than the numbers currently reported.
- Table 3.8 – Comments in the text related to the table suggests that 2% is some form of benchmark for oil spill dispersion rate. It is not clear what is the basis for reliance on such a number, what the reference authority for this number is, and whether it is an ecologically useful number.

Section 4.1 – Physical Environment

It is notable that the description of the physical environment lacks a comprehensive overview on climate change. While there are a few statements regarding climate change, nothing substantive is reported. This needs to be included in the SEA. In this, the document should include general information on the most current projections relative to air and sea temperatures, currents, primary productivity and changes in frequency of extreme weather based on regional climate change models. This would include consideration of which models are considered best right now for the study area in question; and data gaps and key uncertainties. These projections should be also be integrated into subsequent areas of text throughout the SEA as required (e.g. the sections on ice and ice bergs as well as in the species accounts where information is available).

Section 4.1.1 – Geology

- Note that multiple references for Piper (pers. comm.) exist in this section. Since this is an area of active research, and since the SEA is a living document, this section should be updated on a priority basis as the research is published.
- The explicit risk of a landslide (1/500) is included in the SEA, yet the risks for other geohazards are not specified. This is also reported as a personal communication which may not be particularly useful for future planning. This section should be updated to include the anticipated report from Natural Resources Canada that contains slope failure risk maps. This would provide operators with useful information at the planning stages.
- A map of the features of the Orphan Basin described in this section should be included. They are not in Figure 4.3.

Section 4.1.2 – Bathymetry

- As knowledge of bathymetry is important to understanding many key aspects of the physical and biological environment, it would be helpful to include major bathymetric contours/features in a clear manner on all maps depicted within the report (e.g., Figure 1.1), similar to that in Figure 2.2. Otherwise, maps provide very little frame of reference.
- Figure 4.6 – The figure should indicate in title or legend that bathymetry is in ‘m’.

Section 4.1.3 – Climatology

- Precipitation figures need a better explanation for the y-axis indicating whether the frequency of occurrence (%) refers to event duration per month or number of events per month or per day.
- The data for frequency of thunderstorms looks odd. Figure 4.26 shows a big spike in July while Figure 4.28 has a big dip in September. Could these be the result of calculation errors? Since this is a 63-year climatology it should not be related to sample size and interannual variability.

Section 4.1.4 – Oceanography

- The description on extreme wind and wave events partially captures the level of integration and comprehensiveness that is required to make all the information presented useful. However, it is problematic in that it lacks a climate change context.

Section 4.2 – Biological Environment (4.2.1 Fish and Fish Habitat)

A poor description of the ecosystem structure in the study area exists in the SEA. The study area for the SEA essentially expands over at least four different functional ecosystem production units: 1) Grand Bank; 2) Newfoundland-Labrador Shelf (both parts of the Newfoundland-Labrador Shelves marine ecosystem); 3) Flemish Cap (considered a relatively closed marine ecosystem); and 4) oceanic waters beyond the continental shelf break. Furthermore, the study area includes the transition areas between these ecosystems, and given the large range in depths involved in SEA study area, it may be argued that it also spans bathypelagic and abyssal oceanic ecosystems. These very basic descriptions and their potential implications, currently absent in the SEA, need to be incorporated.

It should be highlighted that the basic ecoregion structure in the Grand Bank indicates that the Grand Bank and the Labrador-Newfoundland Shelf can be considered ecosystem sub-units, where the northern Grand Bank (NAFO Division 3L) acts as a transition zone between these subunits. It is also clear the existence of a distinct shelf-break ecoregion, which acts as a transition zone (ecotone) between shelf and oceanic realms (Pepin *et al.* 2010, NAFO 2010b, 2012a). The Flemish Cap also emerges as a distinct ecosystem production unit (Perez-Rodriguez *et al.* 2010, NAFO 2010b). Note that the Grand Bank and Flemish Cap are among the candidate ecosystem management units being considered for the development of an ecosystem approach to fisheries by NAFO (NAFO 2010b).

Although the Newfoundland-Labrador Shelves and Flemish Cap share many of their core species and both have experienced collapses of major groundfish components, the structure of these ecosystems is not identical. For example, the key forage species are sandlance and capelin in the [southern] Grand Bank, and shrimp and capelin in the [northern] Newfoundland-Labrador Shelf; while in the Flemish Cap redfish and shrimp have been key prey species for that ecosystem (NAFO 2010b, 2011, 2012, Perez-Rodriguez *et al.* 2011, 2012). Furthermore, there is evidence in the NL shelves of bottom-up regulation of capelin, its overall core forage fish species, with linkages between environmental drivers (e.g. ice dynamics), phytoplankton

blooms, zooplankton abundance, and capelin dynamics (DFO 2012, Buren *et al.* 2014). Here, the dynamics of upper trophic levels (e.g. Atlantic cod) seem to have been driven by availability of food (capelin) and fishing (DFO 2012, Buren *et al.*, submitted). However, the influence of ice dynamics on ecosystem trends is not observed in the Flemish Cap ecosystem (NAFO 2011). Besides the impact of fishing, environmental drivers seem to be influencing recruitment success, while predation by top predators appears to regulate the dynamics of juvenile and smaller fishes here (Perez-Rodriguez *et al.* 2013). Strong trophic interactions also link the core species (cod, redfish and shrimp) in the Flemish Cap ecosystem (NAFO 2011, 2012a).

The above highlights that while the basic ecosystem organization and dynamics that exists in the SEA study area is not described by the SEA document, there are analyses and information available to produce the strategic/broad base description that could provide managers/decision makers with a more functional and holistic perspective of the ecosystems that are potentially affected by oil and gas development.

Section 4.2.1 – Fish and Fish Habitat

- The report provides a comprehensive review of the biology, ecology, distribution and general aspects of the life history of several relevant fish species inhabiting the Grand Bank and southern Labrador shelf. In general the data shown in the Figures and Tables are accurate and informative, and the references cited in the report are generally up to date, with a few exceptions. An interesting aspect of this report is the integrated approach used to describe fish habitat and how it varied temporally and spatially, including the interrelationships of the various trophic/ecological components.
- The SEA contains only partial survey information and exhibits a lack of understanding of the limitations of the DFO trawl surveys. It is notable that the SEA only considers research survey information from DFO, but survey programs conducted by the European Union (EU), and/or some of its member states, exist. These research surveys, focused on the Flemish Cap, but also on the nose and tail of the Grand Bank, are routinely used by NAFO Scientific Council to assess fish stocks in the area, as well as ecosystem structure and interactions. Numerous NAFO documents and papers describe and analyze data from these surveys (e.g. NAFO 2010a; 2010b; 2011; 2012a; Perez-Rodriguez *et al.* 2011; 2012; Nogueira *et al.* 2013).
- While the SEA mentions the changes in areal coverage and gear of DFO surveys referenced (page 161), it also indicates that 4 invertebrate species passed its screening process – failing to recognize that only shrimp and crab have been consistently recorded in DFO surveys since the switch to the Campelen gear in 1995-1996. As such, it is actually impossible to establish if other invertebrates (e.g. brittle stars and/or sea urchins, among others) could have met or not the SEA screening criteria. It should be noted, however, that consistency in the recording of invertebrates in DFO surveys has been improved in recent years. Also, as part of the DFO Ecosystem Research Initiative (ERI) NEREUS Program during, a grab sampling program was implemented in soft bottoms of the Grand Bank over 2007-2010 (e.g. DFO 2012; Gilkinson 2012). These results should be included in the SEA.
- An incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species exists in the SEA. Over the last 5-7 years, there has been increased research effort devoted to the identification, characterization, and mapping of Vulnerable Marine Ecosystem (VME) indicator species within the SEA study area. Most of this work has been done under the umbrella of NAFO, and through the NAFO Scientific Council (SC) Working Group on Ecosystem Approaches to Fisheries Management (WGEAFM; recently been renamed SC Working Group on Ecosystem Science and Assessment (WGESA)). Most of this work is not included or mentioned in the current SEA. Furthermore, some recent and

relevant studies like Baillon *et al.* (2012) and Beazley *et al.* (2013) are referenced in the text, but absent in the references section, and some of their implications not included in the document. For example, Baillon's study documents the linkage between seapens (corals) and redfish larvae, and makes the case for seapen fields to be considered essential fish habitat for redfish. This potentially critical role of seapen fields for redfish is absent from Table 4.62 (overview of key groundfish species in the SEA area), and there is no mention of this linkage in Table 5.1. (fish and fish habitat potential environmental interactions).

- It should be noted that sponge grounds are among the more abundant VME indicator species in the SEA study area, but little attention is paid to these in Table 5.1., including the impacts of potential spills on these large grounds of filter-feeding, habitat forming species. Spill simulations described in SEA also seem to focus on either shoreline/surface impacts or highlights that spills will drift east (beyond 50°W). No attempt to assess the impact of these trajectories on VMEs exists in the current SEA, even though potentially damaging biogenic essential fish habitat could have serious long term impacts on ecosystem productivity.
- Although corals and sponges have been the initial focus in the study of VMEs, many other taxa have been identified as VME indicator species. These include tube-dwelling anemones, erect bryozoans, and crinoids. Several physiographic features (e.g. seamounts, canyons, the Southeast shoal) have also been identified as VME elements because they contain (or are likely to contain) VMEs (NAFO 2012). These other VME components are not discussed in any detail in the SEA, nor is an assessment of the potential impact of oil and gas exploration/production on them considered.
- Many of the NAFO reports from the Scientific Council meetings since 2008, and reports from the SC WGEAFM (and references within), summarize most of the available information on VMEs in the SEA study area. These reports should be used in the SEA not just to describe what is known on VMEs, but also to inform/construct scenarios for spill simulation studies.
- The upcoming NAFO SC WGESA report (to be released in May 2014) will contain an updated summary on VMEs, as well as an analysis of adequacy for current NAFO VME closures. This report will also contain recent findings that suggest that VME areas may be linked to higher fish densities, highlighting the potential importance of these areas for overall ecosystem production. Although it would have been impossible for the SEA drafting team to be aware of these unpublished results within the draft SEA, the participation of NAFO within the SEA Working Group could have made them aware of this ongoing work, and possibly made available some of the preliminary results for the SEA drafting team.
- Another important source of information that would be useful for preparation of the final version of the SEA is the report of a Convention on Biological Diversity (CBD) Regional Workshop that took place in Montreal, on 24-28 March 2014 and was intended to facilitate the description of ecologically or biologically significant marine areas in the Northwest Atlantic. The international waters within the SEA study area were part of the area considered by this CBD workshop.

Section 4.2.1.3 – Plankton

- Plankton – The role of plankton in nitrogen and carbon cycling is not well explained. The term “biological pump” is misused. It does not refer to benthic pelagic coupling (which is an important process and should be explained) but rather to the sequestration of biogenic carbon in the deep ocean.
- The description of the causal mechanisms of the spring bloom are incomplete. Onset of stratification and the interaction with light availability are key factors. Incorrect use of the term “biological pump” occurs in this section.

Section 4.2.1.4 – Plants and Microalgae

- Several important aspects of macroalgal communities in the study area are missing from the SEA. Several types of macroalgae, in particular coralline algae, have depth distributions well in excess of 30 m. Urchin-kelp-coralline algae dynamics are an important determinant of hard substrate communities in our waters (Himmelman and Steele, 1971). The substrate of the Grand Banks has been greatly disturbed by trawling which may affect the distribution of macroalgae. Fishing exclusion zones and artificial reefs may change this and provide refuges for macroalgae. Seaweed zonation with light is an important determinant of distribution. Seaweed communities are vulnerable to oil spills. Therefore coastal seaweed communities and their structure and function should be included in this section.

Section 4.2.1.5 – Benthic Communities

- All Gilkinson and Edinger (2009) citations should be Gilkinson and Edinger (eds.) (2009).
- As different types of benthic communities are sensitive to different types of disturbance, this should be discussed and summarized in a table for easy reference and decision-making.
- Regarding the statement, “...and DFO and NAFO RV surveys...” “...visual assessments also poorly...” What is meant by ‘visual assessments’ here?
- Regarding the statement, “*It is also important to note that characterizations of benthic communities are also inevitably biased according to sampling method. For example, visual assessments often poorly assess infaunal communities whereas grabs may have challenges sampling communities over harder substrates.*” It should also be noted that bottom trawls typically sample only a small fraction of resident benthos, and most often larger epibenthos.
- The statement, “*Collectively, these studies confirm that benthic communities in the SEA Study Area are quite diverse compared to higher trophic levels, as well as being somewhat sensitive to anthropogenic effects...*”, requires qualification. When speaking in terms of sand-dominated continental shelves, the global literature on fishing impacts in these habitats indicate that, in many cases, recovery can be relatively rapid (e.g. months). However, in deep-water slope environments inhabited by slow growing, long-lived corals and sponges, recovery could be measured in terms of decades in many cases, if not longer (Gilkinson and Edinger (eds.)(2009)).
- Further to the statement, “*Perhaps the most holistic sampling was done on the Grand Banks as part of a series of trawling impact studies (Prena et al. 1999; Kenchington et al. 2001)*”, it should be noted that these researchers used video and grabs (Kenchington et al 2001) and a benthic sled and trawl bycatch (Prena et al. 1999).
- Table 4.58 – Some non-shellfish species (e.g., sea urchins, polychaetes, sponges etc.) are included in this table summarizing shellfish species.
- Table 4.58 – Regarding the statement, “*Spat settle primarily between August and November at depths of 10-15 m.*”, it should be noted that they also settle in deep offshore water – primarily gravel, on Grand Bank (Gilkinson and Gagnon, 1991).
- Table 4.58 – Information on ‘Pale Sea urchin’ should reference Gagnon and Gilkinson (1994).
- Table 4.58 – Information on ‘surf clam’ is incorrect. Surfclams (*Spisula solidissima*) are mostly confined to warmer waters, which on Grand Bank, is the Tail of the Bank and Southeast Shoal. The species that is harvested commercially north-east of this area is the

Arctic surfclam (*Mactromeris polynyma*), with only sporadic occurrences of *S. solidissima*. Contact Elaine Hynick, Science Branch, DFO for more detailed information.

- Table 4.58 – Information on Polychaete worms indicates that they occur on a variety of substrates. However, much of Grand Bank is comprised of sandy sediments which support abundant and diverse populations (documented by Kenchington *et al.*, 2001).
- The statement, “*Studies to date indicate that, like fish, benthic assemblages respond to environmental variables such as depth, substrate and flow field (Houston and Haedrich 1984; Schneider et al. 1987).*”, requires addition of the following references related to Grand Banks benthos: Gilkinson and Gagnon, 1991; Gilkinson, 2013; Gale *et al.* (in press).
- Amphipod prey includes much more than just seaweed and phytoplankton. They have many diverse and ecologically important feeding modes. Many are scavengers and some are aggressive predators.
- Polychaete information is not comprehensive. The available literature should be used to provide data on diet and ecological roles of these important members of the benthos.
- The statement, “*Collectively, sea pens, soft corals, stony corals, and sponges are represented across the shelf, slopes and banks of the Study Area but are found at their highest densities along the slopes, i.e. depths > 200 m.*”, requires addition of references Wareham and Edinger (2007); Wareham (2010).
- The statement, “*Sponges, in contrast are more widely distributed and high densities can be found along the eastern slopes of the Grand Banks, around the Flemish Cap and along the northern slopes of the SEA Area*”, requires a reference.
- Regarding the statement, “*In response to the known sensitivity of coral and sponge grounds, many a number of important coral and sponge areas have been designated as Vulnerable Marine Ecosystems (VMEs) (DFO 2012b) and are protected from damaging fishing activities in Canadian and NAFO waters.*”, it should be noted that with the exception of a portion of the SW Grand Banks slope closure, these fishing closures occur in the NAFO regulatory area outside Canadian waters.
- Table 4.61 – The final column of this table is difficult to read. The number of digits after the decimal is inconsistent and the information is center justified, both of which are inappropriate formats for displaying such data. A right justified and constant number of digits after the decimal (suggested one digit past the decimal to be sufficient for “summary” statistics where precision is unwarranted) is more appropriate.
- Figures 4.70 and 4.71 – The time period covered by the coral and sponge RV records should be stated in the figure titles.

Section 4.2.1.6 – Marine Fish

- Table 4.62 and 4.63 – Tables are listed alphabetically by species. The order of the species should be taxonomic to permit grouping of species into various logical ecological groups.
- Table 4.62 – There is a notable the lack of the most recent publications describing feeding habits and distribution and abundance trends of the three wolffish species found in the study area. The following references should be included in the descriptions for Atlantic Wolffish, Northern Wolffish, and Spotted Wolffish: Simpson *et al.* (2013); Collins *et al.* (2014).
- Table 4.62 – Atlantic Wolffish Habitat and Distribution – Wolffish are found over a variety of substrates (not just “hard clay bottom”), and at depths less than 25 m, and in excess of 250 m.

- Table 4.62 – That Atlantic Wolffish can be retained under SARA, unlike the other two wolffish species, deserves mention, even if this species is not “commercially significant”.
- Table 4.62 – Include fish species as an important component of Cusk diet (Bowman *et al.* 2000). Also include that Cusk is monotypic species in the Northwest Atlantic.
- Table 4.62 – The statement, “A number of research initiatives have also characterized benthic communities on the Grand Banks (Schneider *et al.* 1987; Kenchington *et al.* 2001)”, should include the following references Gilkinson, 2013; Gale *et al.* (in press). Gilkinson (2013) documents benthic communities over areas of Grand Bank as part of the DFO NL NEREUS Ecosystem Research Initiative, which involved a 3-year grab sampling program during multispecies trawl surveys. Gale *et al.* (in press) describe seastar (Asteroidea) assemblages and habitat use over wide areas of the eastern Canadian continental shelf and slope based on DFO survey trawl bycatch records and ROV video.
- Northern Wolffish – The statement “...occurs in Arctic seas on both sides of the North Atlantic Ocean” should be rewritten. Northern Wolffish occurs in both Arctic and Atlantic Oceans, as do other wolffish species – though no mention of this is made. The fact that Northern Wolffish is more pelagic than the other two species should also be noted.
- The statement that Northern Wolffish is distributed as a ‘widespread self-assemblage’, is incorrect. Northern Wolffish are mostly found along the shelf edge, not on the shelf.
- It should be included that, in the past, redfish larvae dominated the ichthyoplankton in many parts of the SEA area (Serebryakov *et al.* 1987).
- The introduction of invasive species and changes to habitat and/or community structure should also be discussed in the context of cumulative effects.
- The statement, “A total of four invertebrate taxa (snow crab, northern shrimp, pink striped shrimp, and shrimp *Pandalus propinquus*) were available from the Canadian Research Vessel surveys (Table 4.60)”, requires clarification. These are the major commercial spp., however many other non-commercial taxa have been processed using standardized protocols during RV surveys since 2005/2006. The point of availability is inaccurate.
- Roughhead Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic only. A publication by Edinger *et al.* (2007) contains information on Roughhead Grenadier in NL waters. Specifically, it reports that Roughhead Grenadier were found in association with deep-sea corals, such as gorgonians, antipatharians, and soft corals at depths of 200-1000 m.
- Roundnose Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic only. In the Northwest Atlantic, the species has been caught at depths less than 400 m. The data provided for NL comes from Parsons 1976. Newer information is available in Power and Maddock-Parsons (1998), and Kulka (2001). Most catches of this species occurred at depths of 900 m or more.
- Spotted Wolffish – Spawning in late autumn and early winter was suggested by Templeman 1966. A more recent publication (Templeman 1986) suggested mid to late summer spawning (July-August-Sept).
- White Hake – White Hake occur at depths much less than 200 m. On the western St. Pierre Bank, and southwest slope of the Grand Bank, they frequently occur at around 100 m (Han and Kulka 2007). Juvenile White Hake are commonly found inshore, and may even occupy estuaries. Reference to Longfin Hake (*U. chesteri*) is not appropriate.

- White Hake – Not all juvenile White Hake are pelagic. The juvenile stage of the life cycle is characterized by pelagic and (later) demersal components.
- Winter Skate – Kelly and Hanson (2013) estimated that 40-70 egg cases are deposited each year. Also, cephalopods (squid) are an important component of the diet.
- Herring – The occurrence for this species has been recorded up to 450 m in multispecies surveys.
- Capelin – Capelin are found in 3NLOPs in spring RV survey. Include 3K and 2J from fall RV survey. Besides the RV trawl surveys, capelin distribution information is available from annual DFO acoustic surveys.
- Capelin – The information related to ‘subsequently spent adults...’ is incorrectly stated and cited. Spent females move out to deeper water after spawning on beaches/bottom sites. Those that survive eventually migrate to offshore feeding areas and likely aggregate with capelin that will be maturing and spawning next year. The timing, the route, and mechanisms used to migrate from coastal waters to offshore feeding areas have not been knowingly documented.
- Include cephalopods as a major component of the Shortfin Mako diet.
- Include reproduction of White Sharks via internal fertilization, with development characterized by aplacental viviparity (also known as ovoviviparity) with embryonic oophagy. See Saïdi *et al.* 2005.
- Table 4.54 – Capelin spawning on Southeast Shoal takes place in June, July. Capelin also spawn on the bottom in coastal waters.
- Table 4.54 – Capelin spawning time (cumulatively) on beaches and coastal bottom sites and the Southeast Shoal encompasses May, June, July, August.
- Table 4.54 – No corresponding footnote reference exists for superscript #4 (Atlantic Cod).
- Table 4.54 – Sandlance spawning season is winter (December-March) not June–August as indicated in the table.
- Table 4.65 – There is much accompanying text around this table related to the inflated representation introduced by comparing numbers among various body sizes (e.g., cod versus sand lance). Agreed this is important – suggested to add a Table be added as a companion table which reports not numbers, but rather weight of catch by species reflecting the biomass of the various species in the SEA area.
- Sandlance – Table 4.65 states Sandlance constitute 6% of RV catch while the text states they constitute 30%.
- Sandlance – The report should include information regarding habitat usage of Sandlance, i.e., burrowing in substrate part of day; migrating vertically to feed; and no distance migrations as are closely associated with their habitat.
- Sandlance – It should be noted that inshore and offshore sandlance are two different species. The report should highlight which species is impacted by any proposed work.
- Atlantic Cod – Other than a line in one of the tables in this section of the report, there is no mention of Atlantic cod, despite the existence of a published Atlantic cod Recovery Potential Assessment in 2011 (DFO-CSAS).

Section 4.2.1.8 – Environmental Influence and Changes

- The section on Environmental Influence and Changes does provide some useful information on climate change in regards to fish and invertebrates; however, the context needs to be improved with the addition of information of the role of the North Atlantic Oscillation (NAO) and more comprehensive text on climate change in general (either in the existing text or earlier in sections on the physical environmental setting).

Section 4.2.1.9 – Aquatic Invasive Species

- Table 4.67 – Green crab is also one of the few AIS which are known to destroy fish habitat (i.e., eelgrass), thereby affecting recruitment of some species (e.g., Morris et al 2010).

Section 4.2.1.10 – Ecological.ly and Biological.ly Significant Species (EBSAs)

- The recent identification and description of additional EBSAs in the NL Shelves area (DFO 2013) is mentioned, but has not been adequately incorporated into this report. The data layers for these EBSAs can be provided upon request. Notably, The Orphan Spur EBSA, and possibly the edge of the Notre Dame Channel EBSA, overlap with the study area.
- Ecologically and Biologically Significant Areas (EBSAs) – *Southeast Shoal and Tail of the Banks* – It should also be noted here that the Southeast Shoal is an area with some of the highest (if not the highest) benthic biomasses recorded anywhere in the world due to the standing biomass of populations of the Arctic wedge clam, *Mesodesma* sp.
- Figure 4.89 – It is unnecessary for EBSAs outside the Eastern NL SEA boundaries to be included.

Section 4.2.1.11 – Other Ecological.ly Important Areas

- Figure 4.90 – Ecologically Important Areas Identified in the Orphan Basin SEA (2003). The color designation for the Orphan Basin area should be a darker shade to differentiate from the surrounding area.
- Legends provide a color scheme for abundance/biomass/species richness in Figures 4.91-4.93. It is not indicated how these were derived. No units are shown.

Section 4.2.3 – Marine Mammals and Sea Turtles

- Given the objectives of the SEA, the document is generally well written as it pertains to marine mammals. However, similar to other sections in the document, this text also lacks synthesis and integration of information from a trophic dynamics and changing marine environment perspective. Where possible this deficiency needs to be addressed (particularly in the case of threatened and endangered species).
- In either the Introductory paragraph on Mysticetes (4.2.3.1) or the in the supporting tables (under Foraging Strategy and Food Sources), additional text is required to emphasize that these species migrate into our waters to feed for a limited amount of time on relatively specific prey species that are densely aggregated with variable distribution and abundance. As the information is presented now, these key ecological factors do not receive the attention required.
- There is no mention in any of the tables or Introductory paragraphs for either Mysticetes or Odontocetes that most of these species have complex social structures and communication systems. Although group size is mentioned in the tables, this doesn't adequately highlight these important behavioral traits.

- The information on Pinnepeds (Section 4.2.3.3) needs to be expanded so that harp seals, hood seals and grey seals are treated separately in the summary table (i.e. in the same manner key whale species were addressed). Although there are similarities in the ecology of harps and hoods, there are enough differences that lumping both species together results in a summary table with content that is too general to be useful. The timing and use of ice habitat for whelping needs to be a focus for each of these two species. There is also a climate change aspect that should be presented and discussed (there is published literature on this topic as well as new information becoming available pers. comm. Garry Stenson). Note that a recent publication on satellite movements of hooded seals indicates that there is significant feeding along the shelf edge to the east of the 'Northeast Shelf Slope' EBSA (Anderson *et al.* 2012).
- Note that there are likely harbour seals present along the southern shore of the Avalon Peninsula for most of the year in addition to the Bays along the south coast.
- In March 2014 the Convention on Biological Diversity conducted a science advisory workshop to delineate EBSAs in the Northwest Atlantic Area, including areas beyond the 200mile limit. The shelf break area from the vicinity of Lilly/Carson Canyon extending northward to approximately 48° N was identified as a potential EBSA and further emphasizes the biological importance of this slope habitat.

Section 4.3 – Human Activities (4.3.4 Marine Fisheries)

An incomplete (and potentially misleading) description of fishing activities exists in the SEA. Virtually the entire section related to marine fisheries within the current SEA is constructed on the basis of Canadian fisheries, or foreign fisheries which land their catches in Canadian ports. This view of the fishing activities that take place in the SEA study area is limited and incomplete. The entire section related to this topic suggests a distribution of fishing activities that omits entirely the international fisheries operating outside the EEZ managed by NAFO, and therefore most of the maps could mislead an uninformed reader to believe, for example, that there is essentially no fishing going on in the Flemish Cap, or that the Sackville Spur has no fishing whatsoever, when in reality this is one of the areas in the region that has the highest levels of fishing effort (e.g. NAFO 2012a).

Explicitly, it is not implied that that these omissions and shortcomings are intentional, but it is highlighted that they effectively render the entire analysis of marine fisheries useless. The SEA states, *"Although the DFO datasets are known not to be comprehensive, particularly with regard to important inshore fisheries, the information provides a useful regional picture of fishing activity in the area that is considered adequate and appropriate for the purposes of the SEA"*. However, this cannot be assumed true. Offshore, without integrating the information from Canadian and international fisheries it is impossible to assess if the picture provided is adequate and appropriate. As such, the entire section on marine fisheries should be redone to incorporate international fishing effort data. These data, in aggregated format, could be requested from the NAFO Secretariat. Note also that Campbell and Feridizon (2013) provide data for fishing vessel activity in the areas governed by NAFO for 2011 and 2012.

To permit a general visual comparison of fisheries activities in the study area with and without inclusion of NAFO data, see Figure 1; Appendix 1 that compares Figure 4.122 from the SEA report (commercial fishing locations in 2008-2012) and Figure 4.2.2.1.7 from NAFO (2012a) (common fishing effort areas derived from VMS data in 2008-2011). Such information should be combined with the fishing effort information from DFO to provide a complete picture of fishing in the SEA area.

Section 5 – Environmental Interactions, Mitigation and Planning Considerations

In general, with regards to environmental interactions, mitigation and planning considerations, the report presents an overview of some of the possible interrelationships resulting from potential offshore oil and gas activities on the Grand Bank and adjacent areas (e.g., Table 5.1) by listing the major activities related to seismic surveys, exploration, drilling and production activities, and how these activities might potentially impact fish and fish habitat, while considering results from previous studies and other sources of available information. However, some areas remain vague in this regard, as do many of the environmental mitigation measures.

Section 5.1 – Fish and Fish habitat (effects assessment)

- This section is a weak summary of other summaries. It is not comprehensive and will not serve as a useful reference. Our understanding has changed dramatically with the research following the Macondo blowout. This should be reflected in this summary.
- Table 5.1 – Information in the table is not adequate. The table is incomplete and often cites reviews of reviews. It is noted in the header that the table is a “*Summary of Some Known and Potential Environmental Effects Based on Available Information Sources*”. This implies that a thorough job of reviewing and summarizing the existing literature for this aspect of the report was not undertaken.
- Table 5.1 – It should be noted that accidental spills of oils or other substances onto the Southeast Shoal during the period capelin are spawning, eggs are incubating, and yolk sac larvae are in the sediment could have a negative impact on that year class and subsequent spawning biomass.
- The bullet, “*Changes in the presence, abundance, distribution and/or health of fish and invertebrates...*” is vague. Direct mortality of marine organisms (at various stages of development) resulting from exposure to oil pills should be stated explicitly instead.
- Produced water effects should include increased nutrient loading and the ecosystem consequences for benthic pelagic coupling and production (Rivkin *et al.* 2000).
- Tannen *et al.* (2nd line) is cited incorrectly. The effects found relate to increased oxygen demand not oxygen enrichment. Produced water effects in this section are related to discharge not flaring. Rye *et al.* (2003) is not in the list of references.
- Mitigations for ballast water introduction of invasive species are included, but not for fouling organisms on hulls, drilling rigs or equipment. Protocols for mitigation of these introduction vectors should also be included in this section.
- It is indicated that the Southeast Shoal is a nursery for yellowtail flounder. However, it should also be acknowledged that the Southeast Shoal is the only spawning site for the Southeast Shoal capelin stock.
- The report suggests ‘*avoiding species at risk where possible during the planning and conduction of oil and gas activities in the offshore*’ as a mitigation procedure. However, since the three wolffish species are found throughout the study area, no practical avoidance exists. What should be a practical mitigation measure in the case of wolffish or white sharks?
- There are no considerations in the report regarding accidental oil spills vis-à-vis fish species at risk and their habitat. This study includes the spatial distribution of abundance indices for the three wolffish species; and potential spatial and temporal trajectories of oil spills have been modelled and/or simulated in previous studies (e.g. Net Environmental Benefit Analysis of Dispersant Use for Responding to Oil Spills from Oil and Gas Facilities on the

Newfoundland Grand Banks, 2013); both sources of information could be used to assess the impact of oil spills on the wolffish populations components found in the study area and could also be used as a framework for identifying appropriate mitigation measures in the case of oil spills.

Section 5.3 – Marine Mammals and Sea Turtles (Effects Assessment)

This section of the document is generally well written as it pertains to marine mammals given the objectives of the SEA. However, it is noted the sections on Important Areas and Times for each of the key VEC species groups (e.g. Marine Mammals and Sea Turtles - 5.3.3.2) have considerable repetition from earlier sections of text. While some of this is warranted, there should also be an effort to link this information with the appropriate mitigation measures presented in each of the preceding sections of text.

- The risk from ingestion of floating debris (i.e. plastic bags) for turtles should be discussed and garbage management and on shore disposal proposed as mitigations.

Section 5.4 – Sensitive and Special Areas (Effects Assessment)

- The effects of drilling wastes on sensitive and sessile benthic species such as corals and sponges are not well understood. However, since they are filter feeders and known to be sensitive to increased sedimentation, organic matter loading, and quality of suspended particulate material, it can be anticipated that they will be negatively affected. There is also very little information on the potential effects of seismic exploration on these organisms. These aspects should be highlighted as a critical information gap within this consideration of sensitive and special areas.
- The mitigation for cumulative effects is to reduce overlap of projects. This is not realistic. Overall this section is inadequate and does not summarize or address the potential for cumulative effects. It should include interactions between activities as well as thresholds for effects and consider climate, habitat and foodweb change as possible drivers.
- This section implies that only designated VMEs and Coral Areas will be considered in this section. Other coral and sponge populations are only briefly referred to in the ecosystem overview and generally ignored in the assessment of potential effects.

Section 5.6 – Cumulative Environmental Effects

This section is very superficial as presented. It is noted within the report that information on cumulative effects is undeveloped here because upcoming projects and their footprints are unknown. However, there is there is also no attempt to describe how cumulative effects are currently being assessed nor is there acknowledgment and discussion regarding the advancements in cumulative effects research in recent years. These issues need to be addressed.

Specifically regarding the issue of unknown projects and unknown project footprint sizes as an explanation for providing no relevant industry information, it is noted that it is indicated elsewhere in the current SEA and on the C-NLOPB website that up to ten Environmental Assessments for petroleum exploration/production activities are in progress. At the very least, an overview and time line of these activities should be presented here.

Note: DFO conducted a National Science Advisory Process to develop a new framework for large project cumulative effects on marine mammals in March 2014 – contact J. Lawson for details on when this information will become available.

Section 5.7 Information Availability, Requirements and Opportunities

Coral and sponge effects and sensitivity should be identified as a significant information gap.

Section 6 – Summary and Conclusions

Page 444 – Regarding the “**C-NLOPB Note:** Recommendations and conclusions regarding the issuance of rights and any requirement on the restriction of offshore oil and gas activities in the SEA Study Area will be finalized for inclusion in the Eastern Newfoundland SEA Report following the conclusion of the regulatory and public comment period.”, it is not clear what this note means. Does it mean that if DFO/NAFO wants to extend the closure of the coral and sponge VMEs to other human activities that CNLOPB will include this in the SEA?

CONCLUSION

In conclusion, the quality of scientific content presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the document can be considered a reliable source of guidance for policy and management decision-making.

Contributors

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M. Simpson	DFO Science, NL Region
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D. Richards	DFO Science, NL Region

Approved by

Barry McCallum
Regional Director of Science
DFO, Newfoundland and Labrador Region

April 22, 2014

Sources of information

This Science Response Report results from the Science Response Process of April 2014 for the Science Review of the Eastern Newfoundland Strategic Environmental Assessment (SEA).

Additional publications from this meeting will be posted on the [\(DFO\) Science Advisory Schedule](#) as they become available.

Andersen, J. *et al.* 2012. Habitat selection by hooded seals in the Northwest Atlantic Ocean. ICES J of Marine Science.

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Appendix 1: Figures

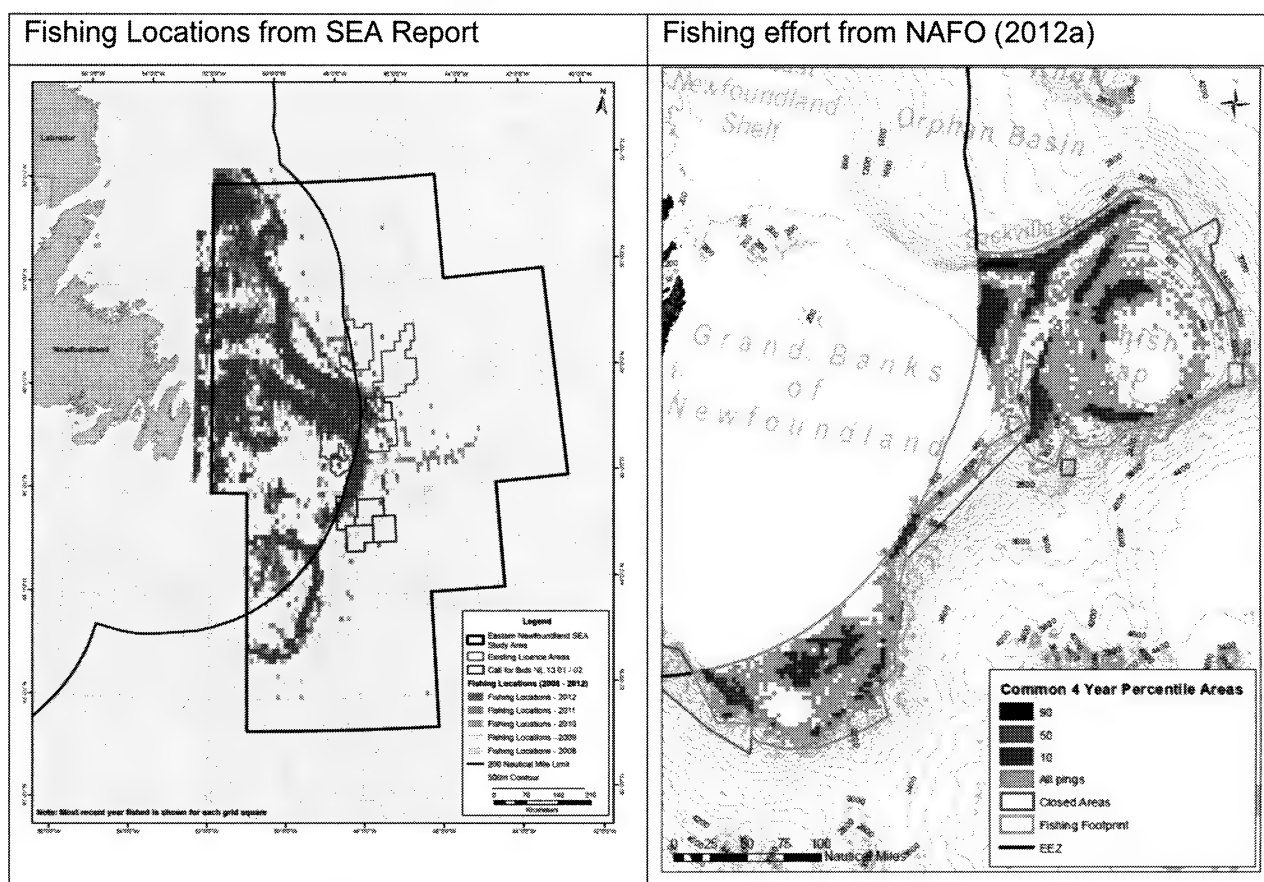


Figure 1. Comparison of Fishing Locations mapping from the Eastern Newfoundland SEA (Figure 4.122 from the SEA report- commercial fishing locations in 2008-2012-) and common fishing effort areas in the NAFO Regulatory Area in 2008-2011 derived from NAFO VMS data (Figure 4.2.2.1.7 from NAFO (2012a)).

This Report is Available from the

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Newfoundland and Labrador Region
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ISSN 1919-3769

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Correct Citation for this Publication:

DFO. 2014. Science Review of the Eastern Newfoundland Strategic Environmental Assessment (SEA). DFO Can. Sci. Advis. Sec. Sci. Resp. 2014/nnn.

Aussi disponible en français :

Richards, Dale E

De: Templeman, Nadine
Envoyé: April-24-14 4:33 PM
À: Sooley, Darrin
Cc: Richards, Dale E
Objet: RE: Review of East NL Strategic Environmental Assessment

Hi Darren,

The document has been approved (with some changes). The final version is attached.
If you have any questions don't hesitate to contact myself or Dale [REDACTED]

Thanks again,
Nadine.

s.19(1)



CSAS SRR
2014_nnn Easter...

From: Templeman, Nadine
Sent: April 22, 2014 10:45 AM
To: Sooley, Darrin
Cc: Richards, Dale E; Templeman, Nadine
Subject: RE: Review of East NL Strategic Environmental Assessment

Hi Darrin,

As agreed, attached is the DRAFT SRP that is currently with the RDS for approval. Please feel free to work with this document until which point I have advised that it has been approved (and will advise of any (unlikely) changes at that time). I expect the OK by later today or tomorrow.

Thank you very much again for allowing us the additional time to incorporate the significant feedback we acquired during our review.
Much appreciated,

<< File: CSAS SRR 2014_nnn Eastern Newfoundland SEA (FINAL).docx >>

Nadine.

Nadine Templeman, B.Sc., M.Env.Sci.
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From: Sooley, Darrin
Sent: April 11, 2014 2:52 PM
To: Richards, Dale E; Templeman, Nadine
Subject: Review of East NL Strategic Environmental Assessment

Hello Dale and Nadine:

Further to our discussion yesterday please note that I received response from CNLOPB that the timeframe for provision of our response can be extended by a week or so which will allow you to provide consolidated Science comments as discussed by late next week or early week of April 21.

If any questions please let me know.

Regards,

Darrin R. Sooley

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SCIENCE REVIEW OF THE EASTERN NEWFOUNDLAND STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

Context

Since 2002, the C-NLOPB has been conducting Strategic Environmental Assessments (SEAs) of portions of the Newfoundland and Labrador Offshore Area that may have the potential for offshore oil and gas exploration activity. SEA is a broad-based approach to environmental assessment that examines the environmental effects which may be associated with a plan, program or policy proposal and that allows for the incorporation of environmental considerations at the earliest stages of program planning. SEA typically involves a broader-scale environmental assessment (EA) that considers the larger ecological setting, rather than a project-specific environmental assessment that focuses on site-specific issues with defined boundaries. Notably, the accuracy of information in a SEA is especially important as it sets the basis for future project-specific EA within its study area.

On March 5, 2014, The Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) released the [Draft Eastern Newfoundland Strategic Environmental Assessment \(SEA\) Report](#) for public comment.

The Environmental Assessment and Major Projects (EAMP) Division of the DFO Ecosystems Management Branch in the Newfoundland and Labrador Region requested that DFO Science undertake a review of this document, and specifically the information put forward in the SEA on the (physical and biological) Environmental Setting: Section 4.1.4 (Oceanography); Section 4.1.5 (Ice conditions); Section 4.2.1 (Fish and Fish Habitat); Section 4.2.3 (Marine Mammals and Sea Turtles); Section 4.2.4 (Sensitive and Special Areas); as well as that on Environmental Interactions, Mitigation and Planning Considerations (i.e., the effects assessment): Section 5.1 (Fish and Fish Habitat); Section 5.3 (Marine Mammals and Sea Turtles); and Section 5.4 (Sensitive and Special Areas).

Given the short timeline to carry out a review, a DFO Science Response process was undertaken. Science expertise within Fisheries and Oceans, Newfoundland and Labrador Region was solicited to address this review – although the provision of feedback was limited to the areas of the report where expertise was available at the time of the review, including that from Ecological Sciences, Marine Mammals, Marine Fish Species at Risk and Pelagic Sections.

The review found that overall the quality of scientific information presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered for incorporation into the final Eastern Newfoundland SEA before using it as a source of guidance for decision-making.

This Science Response Report results from the April 2014 Science Response Process for the review of the *“Eastern Newfoundland Strategic Environmental Assessment (SEA) (AMEC November 2013).”* The report is a summary of the comments provided by DFO Science Branch, Newfoundland and Labrador Region, to the Marine Habitat Protection Section on the above noted sections, as well as other parts of the document where knowledge was available.

Analysis and Response

General Comments

- As the *Eastern Newfoundland Strategic Environmental Assessment* is intended to identify and incorporate environmental considerations at the earliest stages of planning and decision making, it is expected to be broad in its scope, and relatively general in its description of potential impacts associated with oil and gas exploration and/or production in the region within the next decade. However, specific details still remain important in many regards as it is fundamental that the SEA provides a complete and comprehensive system-wide perspective in order to be useful for future project-specific EAs.
- Much of the information describing the existing environment is reasonably complete for the area of the SEA that falls inside the 200 mile limit. However, specific information for the offshore (>200 miles) portion of the study area, and in particular the Flemish Cap and Orphan Basin, is lacking. This is largely attributable to lack of consideration of fishing and research data from NAFO sources and is considered a major weakness in the accuracy of the assessment.
- The SEA is lacking a comprehensive overview on climate change in its description of the physical environment. Only a few statements regarding climate change exist throughout, with nothing substantive reported. Information taken from existing models and the most current projections should be presented for key physical indices where available.
- The SEA does not adequately capture the complexity of the biological environment of the study area. The report does not describe functional ecosystem units or attempt to analyze impacts on their structure and function; but rather simply provides a list of components and compiles potential effects on them, as opposed to on the system as a whole. While this type of description is useful, it is not complete, and carries the risk of promoting “tunnel vision” approaches to management issues.
- The SEA is lacking in its consideration of important aspects of the ecosystem such as trophic structure, ecoregion configuration, linkages between the Grand Bank and the northern Newfoundland shelf, and bottom up regulation of ecosystem productivity – all of which are key to understanding the existing environment and potential interactions.
- The SEA provides incomplete descriptions of Vulnerable Marine Ecosystems (VMEs), and is lacking adequate information for characterization of VME indicator species, including their distribution and the potential impacts of oil and gas exploration/production and spills on these.
- The SEA consideration of potential environmental effects is basic at best, failing to synthesize the current understanding of potential effects. This is also the case for the sections on interactions with other human activities including fishing and sensitive and special areas. The potential for cumulative effects is mentioned in the report, but is not developed.
- The SEA contains data sets that appear to be dated (e.g., DFO fish survey data up to 2009; Sea Ice Atlas to 2010; some tropical storm data to 2000; MSC50 wave/current data to 2011; etc.) While it is understandable that some data sets may not be available after a certain date; it is, however, likely that some are available in an updated format (e.g., the most recent tropical storm data). As such, if a data set is ‘prematurely’ truncated or not being used for some reason – it should be stated within the report and clarification provided. Also, if there are additional data expected, it should be noted when they are likely to become available.

Specific Comments

Section 3.2 – Generic Description of Offshore Oil and Gas Activities

- Primary emissions from offshore production should explicitly list produced water since it is the largest waste stream from that activity.
- Spill data for NL offshore should be updated to include 2013. Spill discussion should also include that spills may be due to aging or leaky infrastructure.
- Oils spills scenarios under ice should be included in tables where available. Although they are mentioned as part of some of the studies, inclusion in the tables would prove useful.
- Table 3.4 – Numbers are not standardized per unit time or capacity; therefore, they are misleading. What are the “lifespans” of the wells in this table – i.e., how many of the 29,527 wells in the 1980’s were also operational in the 1970’s (and hence double counted)? The total number operating during each period may reduce the apparent blowout frequency by referencing existence in more than one of the time periods. The number of operating wells in 1971-80 plus the number of “new wells” minus the number of “decommissioned wells” would be a more meaningful number in this column in this comparison. The number of exploration vs. production wells would be very revealing also. It is suggested that revising the blowout instances per unit time of well operational life would be more informative than the numbers currently reported.
- Table 3.8 – Comments in the text related to the table suggests that 2% is some form of benchmark for oil spill dispersion rate. It is not clear what is the basis for reliance on such a number, what the reference authority for this number is, and whether it is an ecologically useful number.

Section 4.1 – Physical Environment

It is notable that the description of the physical environment lacks a comprehensive overview on climate change. While there are a few statements regarding climate change, nothing substantive is reported. This should be included in the SEA. In this, the document should include general information on the most current projections relative to air and sea temperatures, currents, primary productivity and changes in frequency of extreme weather based on regional climate change models. This would include consideration of which models are considered best right now for the study area in question; and data gaps and key uncertainties. These projections should be also be integrated into subsequent areas of text throughout the SEA as required (e.g. the sections on ice and ice bergs as well as in the species accounts where information is available).

Section 4.1.1 – Geology

- Note that multiple references for Piper (pers. comm.) exist in this section. Since this is an area of active research, and since the SEA is a living document, this section should be updated on a priority basis as the research is published.
- The explicit risk of a landslide (1/500) is included in the SEA, yet the risks for other geohazards are not specified. This is also reported as a personal communication which may not be particularly useful for future planning. This section should be updated to include the anticipated report from Natural Resources Canada that contains slope failure risk maps. This would provide operators with useful information at the planning stages.
- A map of the features of the Orphan Basin described in this section should be included. They are not in Figure 4.3.

Section 4.1.2 – Bathymetry

- As knowledge of bathymetry is important to understanding many key aspects of the physical and biological environment, it would be helpful to include major bathymetric contours/features in a clear manner on all maps depicted within the report (e.g., Figure 1.1), similar to that in Figure 2.2. Otherwise, maps provide very little frame of reference.
- Figure 4.6 – The figure should indicate in title or legend that bathymetry is in 'm'.

Section 4.1.3 – Climatology

- Precipitation figures need a better explanation for the y-axis indicating whether the frequency of occurrence (%) refers to event duration per month or number of events per month or per day.
- The data for frequency of thunderstorms looks odd. Figure 4.26 shows a big spike in July while Figure 4.28 has a big dip in September. Could these be the result of calculation errors? Since this is a 63-year climatology it should not be related to sample size and interannual variability.

Section 4.1.4 – Oceanography

- The description on extreme wind and wave events partially captures the level of integration and comprehensiveness that is required to make all the information presented useful. However, it is problematic in that it lacks a climate change context.

Section 4.2 – Biological Environment (4.2.1 Fish and Fish Habitat)

Overall, ecosystem structure within the study area is not adequately described within the SEA. The study area for the SEA essentially expands over at least four different functional ecosystem production units: 1) Grand Bank; 2) Newfoundland-Labrador Shelf (both parts of the Newfoundland-Labrador Shelves marine ecosystem); 3) Flemish Cap (considered a relatively closed marine ecosystem); and 4) oceanic waters beyond the continental shelf break. Furthermore, the study area includes the transition areas between these ecosystems, and given the large range in depths involved in SEA study area, it may be argued that it also spans bathypelagic and abyssal oceanic ecosystems. These very basic descriptions and their potential implications, currently absent in the SEA, need to be incorporated.

It should be highlighted that the basic ecoregion structure on the Grand Bank indicates that the Grand Bank and the Labrador-Newfoundland Shelf can be considered ecosystem sub-units, where the northern Grand Bank (NAFO Division 3L) acts as a transition zone between these subunits. It is also clear the existence of a distinct shelf-break ecoregion, which acts as a transition zone (ecotone) between shelf and oceanic realms (Pepin *et al.* 2010, NAFO 2010b, 2012a). The Flemish Cap also emerges as a distinct ecosystem production unit (Perez-Rodriguez *et al.* 2010, NAFO 2010b). Note that the Grand Bank and Flemish Cap are among the candidate ecosystem management units being considered for the development of an ecosystem approach to fisheries by NAFO (NAFO 2010b).

Although the Newfoundland-Labrador Shelves and Flemish Cap share many of their core species and both have experienced collapses of major groundfish components, the structure of these ecosystems is not identical. For example, the key forage species are sandlance and capelin in the [southern] Grand Bank, and shrimp and capelin in the [northern] Newfoundland-Labrador Shelf; while in the Flemish Cap redfish and shrimp have been key prey species for that ecosystem (NAFO 2010b, 2011, 2012, Perez-Rodriguez *et al.* 2011, 2012). Furthermore, there is evidence in the NL shelves of bottom-up regulation of capelin, its overall core forage fish species, with linkages between environmental drivers (e.g. ice dynamics), phytoplankton

blooms, zooplankton abundance, and capelin dynamics (DFO 2012, Buren *et al.* 2014). Here, the dynamics of upper trophic levels (e.g. Atlantic cod) seem to have been driven by availability of food (capelin) and fishing (DFO 2012, Buren *et al.*, submitted). However, the influence of ice dynamics on ecosystem trends is not observed in the Flemish Cap ecosystem (NAFO 2011). Besides the impact of fishing, environmental drivers seem to be influencing recruitment success, while predation by top predators appears to regulate the dynamics of juvenile and smaller fishes here (Perez-Rodriguez *et al.* 2013). Strong trophic interactions also link the core species (cod, redfish and shrimp) in the Flemish Cap ecosystem (NAFO 2011, 2012a).

The above highlights that while the basic ecosystem organization and dynamics that exists in the SEA study area is not described by the SEA document, there are analyses and information available to produce the strategic/broad base description that could provide managers/decision makers with a more functional and holistic perspective of the ecosystems that are potentially affected by oil and gas development.

Section 4.2.1 – Fish and Fish Habitat

- The report provides a comprehensive review of the biology, ecology, distribution and general aspects of the life history of several relevant fish species inhabiting the Grand Bank and southern Labrador shelf. In general the data shown in the Figures and Tables are accurate and informative, and the references cited in the report are generally up to date, with a few exceptions. An interesting aspect of this report is the integrated approach used to describe fish habitat and how it varied temporally and spatially, including the interrelationships of the various trophic/ecological components.
- The SEA contains only partial survey information and exhibits a lack of understanding of the limitations of the DFO trawl surveys. It is notable that the SEA only considers research survey information from DFO, but survey programs conducted by the European Union (EU), and/or some of its member states, exist. These research surveys, focused on the Flemish Cap, but also on the nose and tail of the Grand Bank, are routinely used by NAFO Scientific Council to assess fish stocks in the area, as well as ecosystem structure and interactions. Numerous NAFO documents and papers describe and analyze data from these surveys (e.g. NAFO 2010a; 2010b; 2011; 2012a; Perez-Rodriguez *et al.* 2011; 2012; Nogueira *et al.* 2013).
- While the SEA mentions the changes in areal coverage and gear of DFO surveys referenced (page 161), it also indicates that 4 invertebrate species passed its screening process – failing to recognize that only shrimp and crab have been consistently recorded in DFO surveys since the switch to the Campelen gear in 1995-1996. As such, it is actually impossible to establish if other invertebrates (e.g. brittle stars and/or sea urchins, among others) could have met or not the SEA screening criteria. It should be noted, however, that consistency in the recording of invertebrates in DFO surveys has been improved in recent years. Also, as part of the DFO Ecosystem Research Initiative (ERI) NEREUS Program during, a grab sampling program was implemented in soft bottoms of the Grand Bank over 2007-2010 (e.g. DFO 2012; Gilkinson 2012). These results should be included in the SEA.
- An incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species exists in the SEA. Over the last 5-7 years, there has been increased research effort devoted to the identification, characterization, and mapping of Vulnerable Marine Ecosystem (VME) indicator species within the SEA study area. Most of this work has been done under the umbrella of NAFO, and through the NAFO Scientific Council (SC) Working Group on Ecosystem Approaches to Fisheries Management (WGEAFM; recently been renamed SC Working Group on Ecosystem Science and Assessment (WGESA)). Most of this work is not included or mentioned in the current SEA. Furthermore, some recent and

relevant studies like Baillon *et al.* (2012) and Beazley *et al.* (2013) are referenced in the text, but absent in the references section, and some of their implications not included in the document. For example, Baillon's study documents the linkage between seapens (corals) and redfish larvae, and makes the case for seapen fields to be considered essential fish habitat for redfish. This potentially critical role of seapen fields for redfish is absent from Table 4.62 (overview of key groundfish species in the SEA area), and there is no mention of this linkage in Table 5.1. (fish and fish habitat potential environmental interactions).

- It should be noted that sponge grounds are among the more abundant VME indicator species in the SEA study area, but little attention is paid to these in Table 5.1., including the impacts of potential spills on these large grounds of filter-feeding, habitat forming species. Spill simulations described in SEA also seem to focus on either shoreline/surface impacts or highlights that spills will drift east (beyond 50°W). No attempt to assess the impact of these trajectories on VMEs exists in the current SEA, even though potentially damaging biogenic essential fish habitat could have serious long term impacts on ecosystem productivity.
- Although corals and sponges have been the initial focus in the study of VMEs, many other taxa have been identified as VME indicator species. These include tube-dwelling anemones, erect bryozoans, and crinoids. Several physiographic features (e.g. seamounts, canyons, the Southeast shoal) have also been identified as VME elements because they contain (or are likely to contain) VMEs (NAFO 2012). These other VME components are not discussed in any detail in the SEA, nor is an assessment of the potential impact of oil and gas exploration/production on them considered.
- Many of the NAFO reports from the Scientific Council meetings since 2008, and reports from the SC WGEAFM (and references within), summarize most of the available information on VMEs in the SEA study area. These reports should be used in the SEA not just to describe what is known on VMEs, but also to inform/construct scenarios for spill simulation studies.
- The upcoming NAFO SC WGESA report (to be released in May 2014) will contain an updated summary on VMEs, as well as an analysis of adequacy for current NAFO VME closures. This report will also contain recent findings that suggest that VME areas may be linked to higher fish densities, highlighting the potential importance of these areas for overall ecosystem production.
- Another important source of information that will be useful for preparation of the final version of the SEA is the report resulting from a Convention on Biological Diversity (CBD) Regional Workshop that took place in Montreal, on 24-28 March 2014 and was intended to facilitate the description of ecologically or biologically significant marine areas in the Northwest Atlantic. The international waters within the SEA study area were part of the area considered by this CBD workshop.

Section 4.2.1.3 – Plankton

- Plankton – The role of plankton in nitrogen and carbon cycling is not well explained. The term “biological pump” is misused. It does not refer to benthic pelagic coupling (which is an important process and should be explained) but rather to the sequestration of biogenic carbon in the deep ocean.
- The description of the causal mechanisms of the spring bloom are incomplete. Onset of stratification and the interaction with light availability are key factors. Incorrect use of the term “biological pump” occurs in this section.

Section 4.2.1.4 – Plants and Microalgae

- Several important aspects of macroalgal communities in the study area are missing from the SEA. Several types of macroalgae, in particular coralline algae, have depth distributions well in excess of 30 m. Urchin-kelp-coralline algae dynamics are an important determinant of hard substrate communities in our waters (Himmelman and Steele, 1971). The substrate of the Grand Banks has been greatly disturbed by trawling which may affect the distribution of macroalgae. Fishing exclusion zones and artificial reefs may change this and provide refuges for macroalgae. Seaweed zonation with light is an important determinant of distribution. Seaweed communities are vulnerable to oil spills. Therefore coastal seaweed communities and their structure and function should be included in this section.

Section 4.2.1.5 – Benthic Communities

- All Gilkinson and Edinger (2009) citations should be Gilkinson and Edinger (eds.) (2009).
- As different types of benthic communities are sensitive to different types of disturbance, this should be discussed and summarized in a table for easy reference and decision-making.
- Regarding the statement, “...and DFO and NAFO RV surveys...” “...visual assessments also poorly...” What is meant by ‘visual assessments’ here?
- Regarding the statement, “It is also important to note that characterizations of benthic communities are also inevitably biased according to sampling method. For example, visual assessments often poorly assess infaunal communities whereas grabs may have challenges sampling communities over harder substrates.” It should also be noted that bottom trawls typically sample only a small fraction of resident benthos, and most often larger epibenthos.
- The statement, “Collectively, these studies confirm that benthic communities in the SEA Study Area are quite diverse compared to higher trophic levels, as well as being somewhat sensitive to anthropogenic effects...”, requires qualification. When speaking in terms of sand-dominated continental shelves, the global literature on fishing impacts in these habitats indicate that, in many cases, recovery can be relatively rapid (e.g. months). However, in deep-water slope environments inhabited by slow growing, long-lived corals and sponges, recovery could be measured in terms of decades in many cases, if not longer (Gilkinson and Edinger (eds.)(2009)).
- Further to the statement, “Perhaps the most holistic sampling was done on the Grand Banks as part of a series of trawling impact studies (Prena et al. 1999; Kenchington et al. 2001)”, it should be noted that these researchers used video and grabs (Kenchington et al 2001) and a benthic sled and trawl bycatch (Prena et al. 1999).
- Table 4.58 – Some non-shellfish species (e.g., sea urchins, polychaetes, sponges etc.) are included in this table summarizing shellfish species.
- Table 4.58 – Regarding the statement, “*Spat settle primarily between August and November at depths of 10-15 m.*”, it should be noted that they also settle in deep offshore water – primarily gravel, on Grand Bank (Gilkinson and Gagnon, 1991).
- Table 4.58 – Information on ‘Pale Sea urchin’ should reference Gagnon and Gilkinson (1994).
- Table 4.58 – Information on ‘surf clam’ is incorrect. Surfclams (*Spisula solidissima*) are mostly confined to warmer waters, which on Grand Bank, is the Tail of the Bank and Southeast Shoal. The species that is harvested commercially north-east of this area is the Arctic surfclam (*Mactromeris polynyma*), with only sporadic occurrences of *S. solidissima*.

- Table 4.58 – Information on Polychaete worms indicates that they occur on a variety of substrates. However, much of the Grand Bank is comprised of sandy sediments which support abundant and diverse populations (documented by Kenchington *et al.*, 2001).
- The statement, “*Studies to date indicate that, like fish, benthic assemblages respond to environmental variables such as depth, substrate and flow field (Houston and Haedrich 1984; Schneider et al. 1987).*”, requires addition of the following references related to Grand Banks benthos: Gilkinson and Gagnon, 1991; Gilkinson, 2013; Gale *et al.* (in press).
- Amphipod prey includes much more than just seaweed and phytoplankton. They have many diverse and ecologically important feeding modes. Many are scavengers and some are aggressive predators.
- Polychaete information is not comprehensive. The available literature should be used to provide data on diet and ecological roles of these important members of the benthos.
- The statement, “*Collectively, sea pens, soft corals, stony corals, and sponges are represented across the shelf, slopes and banks of the Study Area but are found at their highest densities along the slopes, i.e. depths > 200 m.*”, requires addition of references Wareham and Edinger (2007); Wareham (2010).
- The statement, “*Sponges, in contrast are more widely distributed and high densities can be found along the eastern slopes of the Grand Banks, around the Flemish Cap and along the northern slopes of the SEA Area*”, requires a reference.
- Regarding the statement, “*In response to the known sensitivity of coral and sponge grounds, many important coral and sponge areas have been designated as Vulnerable Marine Ecosystems (VMEs) (DFO 2012b) and are protected from damaging fishing activities in Canadian and NAFO waters.*”, it should be noted that with the exception of a portion of the southwest Grand Banks slope closure, these fishing closures occur in the NAFO regulatory area outside Canadian waters.
- Table 4.61 – The final column of this table is difficult to read. The number of digits after the decimal is inconsistent and the information is center justified, both of which are inappropriate formats for displaying such data. A right justified and constant number of digits after the decimal (suggested one digit past the decimal to be sufficient for “summary” statistics where precision is unwarranted) is more appropriate.
- Figures 4.70 and 4.71 – The time period covered by the coral and sponge RV records should be stated in the figure titles.

Section 4.2.1.6 – Marine Fish

- Table 4.62 and 4.63 – Tables are listed alphabetically by species. The order of the species should be taxonomic to permit grouping of species into various logical ecological groups.
- Table 4.62 – There is a notable lack of the most recent publications describing feeding habits and distribution and abundance trends of the three wolffish species found in the study area. The following references should be included in the descriptions for Atlantic Wolffish, Northern Wolffish, and Spotted Wolffish: Simpson *et al.* (2013); Collins *et al.* (2014).
- Table 4.62 – Atlantic Wolffish Habitat and Distribution – Wolffish are found over a variety of substrates (not just “hard clay bottom”), and at depths less than 25 m, and in excess of 250 m.
- Table 4.62 – That Atlantic Wolffish can be retained under SARA, unlike the other two wolffish species, deserves mention, even if this species is not “commercially significant”.

- Table 4.62 – Include fish species as an important component of Cusk diet (Bowman *et al.* 2000). Also include that Cusk is monotypic species in the Northwest Atlantic.
- Table 4.62 – The statement, “*A number of research initiatives have also characterized benthic communities on the Grand Banks (Schneider et al. 1987; Kenchington et al. 2001)*”, should include the following references Gilkinson, 2013; Gale *et al.* (in press). Gilkinson (2013) documents benthic communities over areas of the Grand Bank as part of the DFO NL NEREUS Ecosystem Research Initiative, which involved a 3-year grab sampling program during multispecies trawl surveys. Gale *et al.* (in press) describe seastar (Asteroidea) assemblages and habitat use over wide areas of the eastern Canadian continental shelf and slope based on DFO survey trawl bycatch records and ROV video.
- Northern Wolffish – The statement “*...occurs in Arctic seas on both sides of the North Atlantic Ocean*” should be rewritten. Northern Wolffish occurs in both Arctic and Atlantic Oceans, as do other wolffish species – though no mention of this is made. The fact that Northern Wolffish is more pelagic than the other two species should also be noted.
- The statement that Northern Wolffish is distributed as a ‘widespread self-assemblage’, is incorrect. Northern Wolffish are mostly found along the shelf edge, not on the shelf.
- It should be included that, in the past, redfish larvae dominated the ichthyoplankton in many parts of the SEA area (Serebryakov *et al.* 1987).
- The introduction of invasive species and changes to habitat and/or community structure should also be discussed in the context of cumulative effects.
- The statement, “*A total of four invertebrate taxa (snow crab, northern shrimp, pink striped shrimp, and shrimp Pandalus propinquus) were available from the Canadian Research Vessel surveys (Table 4.60)*”, requires clarification. These are the major commercial species; however many other non-commercial taxa have been processed using standardized protocols during RV surveys since 2005/2006. The point of availability is inaccurate.
- Roughhead Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic only. A publication by Edinger *et al.* (2007) contains information on Roughhead Grenadier in NL waters. Specifically, it reports that Roughhead Grenadier were found in association with deep-sea corals, such as gorgonians, antipatharians, and soft corals at depths of 200-1000 m.
- Roundnose Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic only. In the Northwest Atlantic, the species has been caught at depths less than 400 m. The data provided for NL comes from Parsons 1976. Newer information is available in Power and Maddock-Parsons (1998), and Kulka (2001). Most catches of this species occurred at depths of 900 m or more.
- Spotted Wolffish – Spawning in late autumn and early winter was suggested by Templeman 1966. A more recent publication (Templeman 1986) suggested mid to late summer spawning (July-August-Sept).
- White Hake – White Hake occur at depths much less than 200 m. On the western St. Pierre Bank, and southwest slope of the Grand Bank, they frequently occur at around 100 m (Han and Kulka 2007). Juvenile White Hake are commonly found inshore, and may even occupy estuaries. Reference to Longfin Hake (*U. chesteri*) is not appropriate.
- White Hake – Not all juvenile White Hake are pelagic. The juvenile stage of the life cycle is characterized by pelagic and (later) demersal components.

- Winter Skate – Kelly and Hanson (2013) estimated that 40-70 egg cases are deposited each year. Also, cephalopods (squid) are an important component of the diet.
- Herring – The occurrence for this species has been recorded up to 450 m depth in multispecies surveys.
- Capelin – Capelin are found in 3NLOPs in spring RV survey. Include 3K and 2J from fall RV survey. Besides the RV trawl surveys, capelin distribution information is available from annual DFO acoustic surveys.
- Capelin – The information related to ‘subsequently spent adults...’ is incorrectly stated and cited. Spent females move out to deeper water after spawning on beaches/bottom sites. Those that survive eventually migrate to offshore feeding areas and likely aggregate with capelin that will be maturing and spawning next year. The timing, the route, and mechanisms used to migrate from coastal waters to offshore feeding areas have not been knowingly documented.
- Include cephalopods as a major component of the Shortfin Mako diet.
- Include reproduction of White Sharks via internal fertilization, with development characterized by aplacental viviparity (also known as ovoviviparity) with embryonic oophagy. See Saïdi *et al.* 2005.
- Table 4.54 – Capelin spawning on Southeast Shoal takes place in June, July. Capelin also spawn on the bottom in coastal waters.
- Table 4.54 – Capelin spawning time (cumulatively) on beaches and coastal bottom sites and the Southeast Shoal encompasses May, June, July, August.
- Table 4.54 – No corresponding footnote reference exists for superscript #4 (Atlantic Cod).
- Table 4.54 – Sandlance spawning season is winter (December-March) not June–August as indicated in the table.
- Table 4.65 – There is much accompanying text around this table related to the inflated representation introduced by comparing numbers among various body sizes (e.g., cod versus sand lance). It is agreed this is important and suggested a companion table be added which reports weight of catch by species rather than numbers to reflect the biomass of the various species in the SEA area.
- Sandlance – Table 4.65 states Sandlance constitute 6% of RV catch while the text states they constitute 30%.
- Sandlance – The report should include information regarding habitat usage of Sandlance, i.e., burrowing in substrate part of day; migrating vertically to feed; and no distance migrations as are closely associated with their habitat.
- Sandlance – It should be noted that inshore and offshore sandlance are two different species. The report should highlight which species is impacted by any proposed work.
- Atlantic Cod – Other than a line in one of the tables in this section of the report, there is no mention of Atlantic cod, despite the existence of a published Atlantic cod Recovery Potential Assessment in 2011 (DFO-CSAS).

Section 4.2.1.8 – Environmental Influence and Changes

- The section on Environmental Influence and Changes does provide some useful information on climate change in regards to fish and invertebrates; however, the context needs to be

improved with the addition of information of the role of the North Atlantic Oscillation (NAO) and more comprehensive text on climate change in general (either in the existing text or earlier in sections on the physical environmental setting).

Section 4.2.1.9 – Aquatic Invasive Species

- Table 4.67 – Green crab is also one of the few AIS which are known to destroy fish habitat (i.e., eelgrass), thereby affecting recruitment of some species (e.g., Morris et al 2010).

Section 4.2.1.10 – Ecologically and Biologically Significant Species (EBSAs)

- The recent identification and description of additional EBSAs in the NL Shelves area (DFO 2013) is mentioned, but has not been adequately incorporated into this report. The data layers for these EBSAs can be provided upon request. Notably, The Orphan Spur EBSA, and possibly the edge of the Notre Dame Channel EBSA, overlap with the study area.
- Ecologically and Biologically Significant Areas (EBSAs) – *Southeast Shoal and Tail of the Banks* – It should also be noted here that the Southeast Shoal is an area with some of the highest (if not the highest) benthic biomasses recorded anywhere in the world due to the standing biomass of populations of the Arctic wedge clam, *Mesodesma* sp.
- Figure 4.89 – It is unnecessary for EBSAs outside the Eastern NL SEA boundaries to be included.

Section 4.2.1.11 – Other Ecologically Important Areas

- Figure 4.90 – Ecologically Important Areas Identified in the Orphan Basin SEA (2003). The color designation for the Orphan Basin area should be a darker shade to differentiate from the surrounding area.
- Legends provide a color scheme for abundance/biomass/species richness in Figures 4.91-4.93. It is not indicated how these were derived. No units are shown.

Section 4.2.3 – Marine Mammals and Sea Turtles

- Given the objectives of the SEA, the document is generally well written as it pertains to marine mammals. However, similar to other sections in the document, this text also lacks synthesis and integration of information from a trophic dynamics and changing marine environment perspective. Where possible this deficiency needs to be addressed (particularly in the case of threatened and endangered species).
- In either the Introductory paragraph on Mysticetes (4.2.3.1) or in the supporting tables (under Foraging Strategy and Food Sources), additional text is required to emphasize that these species migrate into our waters to feed for a limited amount of time on relatively specific prey species that are densely aggregated with variable distribution and abundance. As the information is presented now, these key ecological factors do not receive the attention required.
- There is no mention in any of the tables or Introductory paragraphs for either Mysticetes or Odontocetes that most of these species have complex social structures and communication systems. Although group size is mentioned in the tables, this doesn't adequately highlight these important behavioral traits.
- The information on Pinnepeds (Section 4.2.3.3) needs to be expanded so that harp seals, hood seals and grey seals are treated separately in the summary table (i.e. in the same manner key whale species were addressed). Although there are similarities in the ecology of harps and hoods, there are enough differences that lumping both species together results in a summary table with content that is too general to be useful. The timing and use of ice

habitat for whelping needs to be a focus for each of these two species. There is also a climate change aspect that should be presented and discussed (there is published literature on this topic as well as new information becoming available pers. comm. Garry Stenson). Note that a recent publication on satellite movements of hooded seals indicates that there is significant feeding along the shelf edge to the east of the 'Northeast Shelf Slope' EBSA (Anderson *et al.* 2012).

- Note that there are likely harbour seals present along the southern shore of the Avalon Peninsula for most of the year in addition to the Bays along the south coast.
- In March 2014 the Convention on Biological Diversity conducted a science advisory workshop to delineate EBSAs in the Northwest Atlantic Area, including areas beyond the 200mile limit. The shelf break area from the vicinity of Lilly/Carson Canyon extending northward to approximately 48° N was identified as a potential EBSA and further emphasizes the biological importance of this slope habitat.

Section 4.3 – Human Activities (4.3.4 Marine Fisheries)

An incomplete (and potentially misleading) description of fishing activities exists in the SEA. Virtually the entire section related to marine fisheries within the current SEA is constructed on the basis of Canadian fisheries, or foreign fisheries which land their catches in Canadian ports. This view of the fishing activities that take place in the SEA study area is limited and incomplete. The entire section related to this topic suggests a distribution of fishing activities that omits entirely the international fisheries operating outside the EEZ managed by NAFO, and therefore most of the maps could mislead an uninformed reader to believe, for example, that there is essentially no fishing going on in the Flemish Cap, or that the Sackville Spur has no fishing whatsoever, when in reality this is one of the areas in the region that has the highest levels of fishing effort (e.g. NAFO 2012a).

Explicitly, it is not implied that that these omissions and shortcomings are intentional, but it is highlighted that they effectively render the entire analysis of marine fisheries useless. The SEA states, *"Although the DFO datasets are known not to be comprehensive, particularly with regard to important inshore fisheries, the information provides a useful regional picture of fishing activity in the area that is considered adequate and appropriate for the purposes of the SEA"*. However, this cannot be assumed true. Offshore, without integrating the information from Canadian and international fisheries it is impossible to assess if the picture provided is adequate and appropriate. As such, the entire section on marine fisheries should be redone to incorporate international fishing effort data. These data, in aggregated format, could be requested from the NAFO Secretariat. Note also that Campbell and Feridizon (2013) provide data for fishing vessel activity in the areas governed by NAFO for 2011 and 2012.

To permit a general visual comparison of fisheries activities in the study area with and without inclusion of NAFO data, see Figure 1; Appendix 1 that compares Figure 4.122 from the SEA report (commercial fishing locations in 2008-2012) and Figure 4.2.2.1.7 from NAFO (2012a) (common fishing effort areas derived from VMS data in 2008-2011). Such information should be combined with the fishing effort information from DFO to provide a complete picture of fishing in the SEA area.

Section 5 – Environmental Interactions, Mitigation and Planning Considerations

In general, with regards to environmental interactions, mitigation and planning considerations, the report presents an overview of some of the possible interrelationships resulting from potential offshore oil and gas activities on the Grand Bank and adjacent areas (e.g., Table 5.1) by listing the major activities related to seismic surveys, exploration, drilling and production activities, and how these activities might potentially impact fish and fish habitat, while

considering results from previous studies and other sources of available information. However, some areas remain vague in this regard, as do many of the environmental mitigation measures.

Section 5.1 – Fish and Fish habitat (effects assessment)

- This section is a weak summary of other summaries. It is not comprehensive and will not serve as a useful reference. Our understanding has changed dramatically with the research following the Macondo blowout. This should be reflected in this summary.
- Table 5.1 – Information in the table is not adequate. The table is incomplete and often cites reviews of reviews. It is noted in the header that the table is a “*Summary of Some Known and Potential Environmental Effects Based on Available Information Sources*”. This implies that a thorough job of reviewing and summarizing the existing literature for this aspect of the report was not undertaken.
- Table 5.1 – It should be noted that accidental spills of oils or other substances onto the Southeast Shoal during the period capelin are spawning, eggs are incubating, and yolk sac larvae are in the sediment could have a negative impact on that year class and subsequent spawning biomass.
- The bullet, “*Changes in the presence, abundance, distribution and/or health of fish and invertebrates...*” is vague. Direct mortality of marine organisms (at various stages of development) resulting from exposure to oil spills should be stated explicitly instead.
- Produced water effects should include increased nutrient loading and the ecosystem consequences for benthic pelagic coupling and production (Rivkin *et al.* 2000).
- Tannen *et al.* (2nd line) is cited incorrectly. The effects found relate to increased oxygen demand not oxygen enrichment. Produced water effects in this section are related to discharge not flaring. Rye *et al.* (2003) is not in the list of references.
- Mitigations for ballast water introduction of invasive species are included, but not for fouling organisms on hulls, drilling rigs or equipment. Protocols for mitigation of these introduction vectors should also be included in this section.
- It is indicated that the Southeast Shoal is a nursery for yellowtail flounder. However, it should also be acknowledged that the Southeast Shoal is the only spawning site for the Southeast Shoal capelin stock.
- The report suggests ‘*avoiding species at risk where possible during the planning and conduction of oil and gas activities in the offshore*’ as a mitigation procedure. However, since the three wolffish species are found throughout the study area, no practical avoidance exists. What should be a practical mitigation measure in the case of wolffish or white sharks?
- There are no considerations in the report regarding accidental oil spills vis-à-vis fish species at risk and their habitat. This study includes the spatial distribution of abundance indices for the three wolffish species; and potential spatial and temporal trajectories of oil spills have been modelled and/or simulated in previous studies (e.g. Net Environmental Benefit Analysis of Dispersant Use for Responding to Oil Spills from Oil and Gas Facilities on the Newfoundland Grand Banks, 2013); both sources of information could be used to assess the impact of oil spills on the wolffish populations components found in the study area and could also be used as a framework for identifying appropriate mitigation measures in the case of oil spills.

Section 5.3 – Marine Mammals and Sea Turtles (Effects Assessment)

This section of the document is generally well written as it pertains to marine mammals given the objectives of the SEA. However, it is noted the sections on Important Areas and Times for each of the key VEC species groups (e.g. Marine Mammals and Sea Turtles - 5.3.3.2) have considerable repetition from earlier sections of text. While some of this is warranted, there should also be an effort to link this information with the appropriate mitigation measures presented in each of the preceding sections of text.

- The risk from ingestion of floating debris (i.e. plastic bags) for turtles should be discussed and garbage management and onshore disposal proposed as mitigations.

Section 5.4 – Sensitive and Special Areas (Effects Assessment)

- The effects of drilling wastes on sensitive and sessile benthic species such as corals and sponges are not well understood. However, since they are filter feeders and known to be sensitive to increased sedimentation, organic matter loading, and quality of suspended particulate material, it can be anticipated that they will be negatively affected. There is also very little information on the potential effects of seismic exploration on these organisms. These aspects should be highlighted as a critical information gap within this consideration of sensitive and special areas.
- The mitigation for cumulative effects is to reduce overlap of projects. This is not realistic. Overall this section is inadequate and does not summarize or address the potential for cumulative effects. It should include interactions between activities as well as thresholds for effects and consider climate, habitat and foodweb change as possible drivers.
- This section implies that only designated VMEs and Coral Areas will be considered in this section. Other coral and sponge populations are only briefly referred to in the ecosystem overview and generally ignored in the assessment of potential effects.

Section 5.6 – Cumulative Environmental Effects

This section is very superficial as presented. It is noted within the report that information on cumulative effects is undeveloped here because upcoming projects and their footprints are unknown. However, there is also no attempt to describe how cumulative effects are currently being assessed nor is there acknowledgment and discussion regarding the advancements in cumulative effects research in recent years. These issues need to be addressed.

Specifically regarding the issue of unknown projects and unknown project footprint sizes as an explanation for providing no relevant industry information, it is noted that it is indicated elsewhere in the current SEA and on the C-NLOPB website that up to ten Environmental Assessments for petroleum exploration/production activities are in progress. At the very least, an overview and time line of these activities should be presented here.

Note: DFO conducted a National Science Advisory Process to develop a new framework for large project cumulative effects on marine mammals in March 2014 – contact J. Lawson for details on when this information will become available.

Section 5.7 Information Availability, Requirements and Opportunities

Coral and sponge effects and sensitivity should be identified as a significant information gap.

CONCLUSION

In conclusion, the quality of scientific content presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the document can be considered a reliable source of guidance for policy and management decision-making.

Contributors

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Approved by

Barry McCallum
Regional Director of Science
DFO, Newfoundland and Labrador Region

April 24, 2014

Sources of information

This Science Response Report results from the Science Response Process of April 2014 for the Science Review of the Eastern Newfoundland Strategic Environmental Assessment (SEA).

Additional publications from this meeting will be posted on the [\(DFO\) Science Advisory Schedule](#) as they become available.

Andersen, J. *et al.* 2012. Habitat selection by hooded seals in the Northwest Atlantic Ocean. ICES J of Marine Science.

Baillon S., J-F Hamel, VE Wareham, and A Mercier. 2012. Deep cold-water corals as nurseries for fish larvae. *Front Ecol Environ* 2012; doi:10.1890/120022.

Beazley, L. I., Kenchington E. L., Murillo, F. J., and Sacau, M. 2013. Deep-sea sponge grounds enhance diversity and abundance of epibenthic megafauna in the Northwest Atlantic. – ICES Journal of Marine Science, doi:10.1093/icesjms/fst124.

Buren, A.D., Koen-Alonso, M., and Stenson G. (submitted) The role of harp seals, fisheries and food availability in driving the dynamics of northern cod. *Marine Ecology Progress Series*.

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Templeman, Nadine

From: Korchoski, Connie
Sent: July-03-14 2:10 PM
To: Ladouceur, Geneviève
Cc: Templeman, Nadine
Subject: RE: Submission for Publication - SRR Eastern NL SEA

Everything looks good. Please proceed with posting.

Thanks and have a great day!

Connie

From: Ladouceur, Geneviève
Sent: 2014-July-03 12:13 PM
To: Korchoski, Connie
Subject: RE: Submission for Publication - SRR Eastern NL SEA

Hi Connie,

The science response is now available on the dev site, here is the link; http://wwwdev/csas-sccs/Publications/ScR-RS/2014/2014_035-eng.html

I'll be waiting for your approval before releasing on the website on July 18.

Please note that I removed the phrase "Additional publications from this meeting will be posted on the (DFO) Science Advisory Schedule as they become available" in the Sources of Information section, since as per the summary of meeting products, no other publications will come out of this process.

Thanks!

Genevieve Ladouceur

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Gouvernement
du Canada

Canada

From: Rondeau, Isabelle
Sent: Thursday, May 29, 2014 2:56 PM
To: Ladouceur, Geneviève
Subject: FW: Submission for Publication - SRR Eastern NL SEA

From: Korchoski, Connie
Sent: May 15, 2014 11:42 AM
To: Rondeau, Isabelle
Cc: Templeman, Nadine; Mansour, Atef A H
Subject: Submission for Publication - SRR Eastern NL SEA

Good morning Isabelle.

The CSAS SRR Document "Eastern Newfoundland Strategic Environmental Assessment (SEA)" and the necessary files have been uploaded to CSAS/Submissions/NL/SRR Eastern NL for further action.

Please do not hesitate to contact me if you have any questions or comments.

Thank you and have a great day.

Connie

Connie Korchoski
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SCIENCE REVIEW OF THE EASTERN NEWFOUNDLAND STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

Context

Since 2002, the C-NLOPB has been conducting Strategic Environmental Assessments (SEAs) of portions of the Newfoundland and Labrador Offshore Area that may have the potential for offshore oil and gas exploration activity. SEA is a broad-based approach to environmental assessment that examines the environmental effects which may be associated with a plan, program or policy proposal and that allows for the incorporation of environmental considerations at the earliest stages of program planning. SEA typically involves a broader-scale environmental assessment (EA) that considers the larger ecological setting, rather than a project-specific environmental assessment that focuses on site-specific issues with defined boundaries. Notably, the accuracy of information in a SEA is especially important as it sets the basis for future project-specific EA within its study area.

On March 5, 2014, The Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) released the Draft Eastern Newfoundland Strategic Environmental Assessment (SEA) Report for public comment.

The Environmental Assessment and Major Projects (EAMP) Division of the DFO Ecosystems Management Branch in the Newfoundland and Labrador Region requested that DFO Science undertake a review of this document, and specifically the information put forward in the SEA on the (physical and biological) Environmental Setting: Section 4.1.4 (Oceanography); Section 4.1.5 (Ice conditions); Section 4.2.1 (Fish and Fish Habitat); Section 4.2.3 (Marine Mammals and Sea Turtles); Section 4.2.4 (Sensitive and Special Areas); as well as that on Environmental Interactions, Mitigation and Planning Considerations (i.e., the effects assessment): Section 5.1 (Fish and Fish Habitat); Section 5.3 (Marine Mammals and Sea Turtles); and Section 5.4 (Sensitive and Special Areas).

Given the short timeline to carry out a review, a DFO Science Response process was undertaken. Science expertise within Fisheries and Oceans, Newfoundland and Labrador Region was solicited to address this review – although the provision of feedback was limited to the areas of the report where expertise was available at the time of the review, including that from Ecological Sciences, Marine Mammals, Marine Fish Species at Risk and Pelagic Sections.

The review found that overall the quality of scientific information presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered for incorporation into the final Eastern Newfoundland SEA before using it as a source of guidance for decision-making.

This Science Response Report results from the April 2014 Science Response Process for the review of the “Eastern Newfoundland Strategic Environmental Assessment (SEA) (AMEC November 2013).” The report is a summary of the comments provided by DFO Science Branch, Newfoundland and Labrador Region, to the Marine Habitat Protection Section on the above noted sections, as well as other parts of the document where knowledge was available.

Analysis and Response

General Comments

- As the *Eastern Newfoundland Strategic Environmental Assessment* is intended to identify and incorporate environmental considerations at the earliest stages of planning and decision making, it is expected to be broad in its scope, and relatively general in its description of potential impacts associated with oil and gas exploration and/or production in the region within the next decade. However, specific details still remain important in many regards as it is fundamental that the SEA provides a complete and comprehensive system-wide perspective in order to be useful for future project-specific EAs.
- Much of the information describing the existing environment is reasonably complete for the area of the SEA that falls inside the 200 mile limit. However, specific information for the offshore (>200 miles) portion of the study area, and in particular the Flemish Cap and Orphan Basin, is lacking. This is largely attributable to lack of consideration of fishing and research data from NAFO sources and is considered a major weakness in the accuracy of the assessment.
- The SEA is lacking a comprehensive overview on climate change in its description of the physical environment. Only a few statements regarding climate change exist throughout, with nothing substantive reported. Information taken from existing models and the most current projections should be presented for key physical indices where available.
- The SEA does not adequately capture the complexity of the biological environment of the study area. The report does not describe functional ecosystem units or attempt to analyze impacts on their structure and function; but rather simply provides a list of components and compiles potential effects on them, as opposed to on the system as a whole. While this type of description is useful, it is not complete, and carries the risk of promoting "tunnel vision" approaches to management issues.
- The SEA is lacking in its consideration of important aspects of the ecosystem such as trophic structure, ecoregion configuration, linkages between the Grand Bank and the northern Newfoundland shelf, and bottom up regulation of ecosystem productivity – all of which are key to understanding the existing environment and potential interactions.
- The SEA provides incomplete descriptions of Vulnerable Marine Ecosystems (VMEs), and is lacking adequate information for characterization of VME indicator species, including their distribution and the potential impacts of oil and gas exploration/production and spills on these.
- The SEA consideration of potential environmental effects is basic at best, failing to synthesize the current understanding of potential effects. This is also the case for the sections on interactions with other human activities including fishing and sensitive and special areas. The potential for cumulative effects is mentioned in the report, but is not developed.
- The SEA contains data sets that appear to be dated (e.g., DFO fish survey data up to 2009; Sea Ice Atlas to 2010; some tropical storm data to 2000; MSC50 wave/current data to 2011; etc.) While it is understandable that some data sets may not be available after a certain date; it is, however, likely that some are available in an updated format (e.g., the most recent tropical storm data). As such, if a data set is 'prematurely' truncated or not being used for some reason – it should be stated within the report and clarification provided. Also, if there are additional data expected, it should be noted when they are likely to become available.

Specific Comments

Section 3.2 – Generic Description of Offshore Oil and Gas Activities

- Primary emissions from offshore production should explicitly list produced water since it is the largest waste stream from that activity.
- Spill data for NL offshore should be updated to include 2013. Spill discussion should also include that spills may be due to aging or leaky infrastructure.
- Oils spills scenarios under ice should be included in tables where available. Although they are mentioned as part of some of the studies, inclusion in the tables would prove useful.
- Table 3.4 – Numbers are not standardized per unit time or capacity; therefore, they are misleading. What are the “lifespans” of the wells in this table – i.e., how many of the 29,527 wells in the 1980’s were also operational in the 1970’s (and hence double counted)? The total number operating during each period may reduce the apparent blowout frequency by referencing existence in more than one of the time periods. The number of operating wells in 1971-80 plus the number of “new wells” minus the number of “decommissioned wells” would be a more meaningful number in this column in this comparison. The number of exploration vs. production wells would be very revealing also. It is suggested that revising the blowout instances per unit time of well operational life would be more informative than the numbers currently reported.
- Table 3.8 – Comments in the text related to the table suggests that 2% is some form of benchmark for oil spill dispersion rate. It is not clear what is the basis for reliance on such a number, what the reference authority for this number is, and whether it is an ecologically useful number.

Section 4.1 – Physical Environment

It is notable that the description of the physical environment lacks a comprehensive overview on climate change. While there are a few statements regarding climate change, nothing substantive is reported. This should be included in the SEA. In this, the document should include general information on the most current projections relative to air and sea temperatures, currents, primary productivity and changes in frequency of extreme weather based on regional climate change models. This would include consideration of which models are considered best right now for the study area in question; and data gaps and key uncertainties. These projections should be also be integrated into subsequent areas of text throughout the SEA as required (e.g. the sections on ice and ice bergs as well as in the species accounts where information is available).

Section 4.1.1 – Geology

- Note that multiple references for Piper (pers. comm.) exist in this section. Since this is an area of active research, and since the SEA is a living document, this section should be updated on a priority basis as the research is published.
- The explicit risk of a landslide (1/500) is included in the SEA, yet the risks for other geohazards are not specified. This is also reported as a personal communication which may not be particularly useful for future planning. This section should be updated to include the anticipated report from Natural Resources Canada that contains slope failure risk maps. This would provide operators with useful information at the planning stages.
- A map of the features of the Orphan Basin described in this section should be included. They are not in Figure 4.3.

Section 4.1.2 – Bathymetry

- As knowledge of bathymetry is important to understanding many key aspects of the physical and biological environment, it would be helpful to include major bathymetric contours/features in a clear manner on all maps depicted within the report (e.g., Figure 1.1), similar to that in Figure 2.2. Otherwise, maps provide very little frame of reference.
- Figure 4.6 – The figure should indicate in title or legend that bathymetry is in 'm'.

Section 4.1.3 – Climatology

- Precipitation figures need a better explanation for the y-axis indicating whether the frequency of occurrence (%) refers to event duration per month or number of events per month or per day.
- The data for frequency of thunderstorms looks odd. Figure 4.26 shows a big spike in July while Figure 4.28 has a big dip in September. Could these be the result of calculation errors? Since this is a 63-year climatology it should not be related to sample size and interannual variability.

Section 4.1.4 – Oceanography

- The description on extreme wind and wave events partially captures the level of integration and comprehensiveness that is required to make all the information presented useful. However, it is problematic in that it lacks a climate change context.

Section 4.2 – Biological Environment (4.2.1 Fish and Fish Habitat)

Overall, ecosystem structure within the study area is not adequately described within the SEA. The study area for the SEA essentially expands over at least four different functional ecosystem production units: 1) Grand Bank; 2) Newfoundland-Labrador Shelf (both parts of the Newfoundland-Labrador Shelves marine ecosystem); 3) Flemish Cap (considered a relatively closed marine ecosystem); and 4) oceanic waters beyond the continental shelf break. Furthermore, the study area includes the transition areas between these ecosystems, and given the large range in depths involved in SEA study area, it may be argued that it also spans bathypelagic and abyssal oceanic ecosystems. These very basic descriptions and their potential implications, currently absent in the SEA, need to be incorporated.

It should be highlighted that the basic ecoregion structure on the Grand Bank indicates that the Grand Bank and the Labrador-Newfoundland Shelf can be considered ecosystem sub-units, where the northern Grand Bank (NAFO Division 3L) acts as a transition zone between these subunits. It is also clear the existence of a distinct shelf-break ecoregion, which acts as a transition zone (ecotone) between shelf and oceanic realms (Pepin et al. 2010, NAFO 2010b, 2012a). The Flemish Cap also emerges as a distinct ecosystem production unit (Perez-Rodriguez et al. 2010, NAFO 2010b). Note that the Grand Bank and Flemish Cap are among the candidate ecosystem management units being considered for the development of an ecosystem approach to fisheries by NAFO (NAFO 2010b).

Although the Newfoundland-Labrador Shelves and Flemish Cap share many of their core species and both have experienced collapses of major groundfish components, the structure of these ecosystems is not identical. For example, the key forage species are sandlance and capelin in the [southern] Grand Bank, and shrimp and capelin in the [northern] Newfoundland-Labrador Shelf; while in the Flemish Cap redfish and shrimp have been key prey species for that ecosystem (NAFO 2010b, 2011, 2012, Perez-Rodriguez et al. 2011, 2012). Furthermore, there is evidence in the NL shelves of bottom-up regulation of capelin, its overall core forage fish species, with linkages between environmental drivers (e.g. ice dynamics), phytoplankton

blooms, zooplankton abundance, and capelin dynamics (DFO 2012, Buren et al. 2014). Here, the dynamics of upper trophic levels (e.g. Atlantic cod) seem to have been driven by availability of food (capelin) and fishing (DFO 2012, Buren et al., submitted). However, the influence of ice dynamics on ecosystem trends is not observed in the Flemish Cap ecosystem (NAFO 2011). Besides the impact of fishing, environmental drivers seem to be influencing recruitment success, while predation by top predators appears to regulate the dynamics of juvenile and smaller fishes here (Perez-Rodriguez et al. 2013). Strong trophic interactions also link the core species (cod, redfish and shrimp) in the Flemish Cap ecosystem (NAFO 2011, 2012a).

The above highlights that while the basic ecosystem organization and dynamics that exists in the SEA study area is not described by the SEA document, there are analyses and information available to produce the strategic/broad base description that could provide managers/decision makers with a more functional and holistic perspective of the ecosystems that are potentially affected by oil and gas development.

Section 4.2.1 – Fish and Fish Habitat

- The report provides a comprehensive review of the biology, ecology, distribution and general aspects of the life history of several relevant fish species inhabiting the Grand Bank and southern Labrador shelf. In general the data shown in the Figures and Tables are accurate and informative, and the references cited in the report are generally up to date, with a few exceptions. An interesting aspect of this report is the integrated approach used to describe fish habitat and how it varied temporally and spatially, including the interrelationships of the various trophic/ecological components.
- The SEA contains only partial survey information and exhibits a lack of understanding of the limitations of the DFO trawl surveys. It is notable that the SEA only considers research survey information from DFO, but survey programs conducted by the European Union (EU), and/or some of its member states, exist. These research surveys, focused on the Flemish Cap, but also on the nose and tail of the Grand Bank, are routinely used by NAFO Scientific Council to assess fish stocks in the area, as well as ecosystem structure and interactions. Numerous NAFO documents and papers describe and analyze data from these surveys (e.g. NAFO 2010a; 2010b; 2011; 2012a; Perez-Rodriguez *et al.* 2011; 2012; Nogueira *et al.* 2013).
- While the SEA mentions the changes in areal coverage and gear of DFO surveys referenced (page 161), it also indicates that 4 invertebrate species passed its screening process – failing to recognize that only shrimp and crab have been consistently recorded in DFO surveys since the switch to the Campelen gear in 1995-1996. As such, it is actually impossible to establish if other invertebrates (e.g. brittle stars and/or sea urchins, among others) could have met or not the SEA screening criteria. It should be noted, however, that consistency in the recording of invertebrates in DFO surveys has been improved in recent years. Also, as part of the DFO Ecosystem Research Initiative (ERI) NEREUS Program during, a grab sampling program was implemented in soft bottoms of the Grand Bank over 2007-2010 (e.g. DFO 2012; Gilkinson 2012). These results should be included in the SEA.
- An incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species exists in the SEA. Over the last 5-7 years, there has been increased research effort devoted to the identification, characterization, and mapping of Vulnerable Marine Ecosystem (VME) indicator species within the SEA study area. Most of this work has been done under the umbrella of NAFO, and through the NAFO Scientific Council (SC) Working Group on Ecosystem Approaches to Fisheries Management (WGEAFM; recently been renamed SC Working Group on Ecosystem Science and Assessment (WGESA)). Most of this work is not included or mentioned in the current SEA. Furthermore, some recent and

Newfoundland and Labrador Region Science Response: Eastern Newfoundland SEA

relevant studies like Baillon *et al.* (2012) and Beazley *et al.* (2013) are referenced in the text, but absent in the references section, and some of their implications not included in the document. For example, Baillon's study documents the linkage between seapens (corals) and redfish larvae, and makes the case for seapen fields to be considered essential fish habitat for redfish. This potentially critical role of seapen fields for redfish is absent from Table 4.62 (overview of key groundfish species in the SEA area), and there is no mention of this linkage in Table 5.1. (fish and fish habitat potential environmental interactions).

- It should be noted that sponge grounds are among the more abundant VME indicator species in the SEA study area, but little attention is paid to these in Table 5.1., including the impacts of potential spills on these large grounds of filter-feeding, habitat forming species. Spill simulations described in SEA also seem to focus on either shoreline/surface impacts or highlights that spills will drift east (beyond 50°W). No attempt to assess the impact of these trajectories on VMEs exists in the current SEA, even though potentially damaging biogenic essential fish habitat could have serious long term impacts on ecosystem productivity.
- Although corals and sponges have been the initial focus in the study of VMEs, many other taxa have been identified as VME indicator species. These include tube-dwelling anemones, erect bryozoans, and crinoids. Several physiographic features (e.g. seamounts, canyons, the Southeast shoal) have also been identified as VME elements because they contain (or are likely to contain) VMEs (NAFO 2012). These other VME components are not discussed in any detail in the SEA, nor is an assessment of the potential impact of oil and gas exploration/production on them considered.
- Many of the NAFO reports from the Scientific Council meetings since 2008, and reports from the SC WGEAFM (and references within), summarize most of the available information on VMEs in the SEA study area. These reports should be used in the SEA not just to describe what is known on VMEs, but also to inform/construct scenarios for spill simulation studies.
- The upcoming NAFO SC WGESA report (to be released in May 2014) will contain an updated summary on VMEs, as well as an analysis of adequacy for current NAFO VME closures. This report will also contain recent findings that suggest that VME areas may be linked to higher fish densities, highlighting the potential importance of these areas for overall ecosystem production.
- Another important source of information that will be useful for preparation of the final version of the SEA is the report resulting from a Convention on Biological Diversity (CBD) Regional Workshop that took place in Montreal, on 24-28 March 2014 and was intended to facilitate the description of ecologically or biologically significant marine areas in the Northwest Atlantic. The international waters within the SEA study area were part of the area considered by this CBD workshop.

Section 4.2.1.3 – Plankton

- Plankton – The role of plankton in nitrogen and carbon cycling is not well explained. The term “biological pump” is misused. It does not refer to benthic pelagic coupling (which is an important process and should be explained) but rather to the sequestration of biogenic carbon in the deep ocean.
- The description of the causal mechanisms of the spring bloom are incomplete. Onset of stratification and the interaction with light availability are key factors. Incorrect use of the term “biological pump” occurs in this section.

Section 4.2.1.4 – Plants and Microalgae

- Several important aspects of macroalgal communities in the study area are missing from the SEA. Several types of macroalgae, in particular coralline algae, have depth distributions well in excess of 30 m. Urchin-kelp-coralline algae dynamics are an important determinant of hard substrate communities in our waters (Himmelman and Steele, 1971). The substrate of the Grand Banks has been greatly disturbed by trawling which may affect the distribution of macroalgae. Fishing exclusion zones and artificial reefs may change this and provide refuges for macroalgae. Seaweed zonation with light is an important determinant of distribution. Seaweed communities are vulnerable to oil spills. Therefore coastal seaweed communities and their structure and function should be included in this section.

Section 4.2.1.5 – Benthic Communities

- All Gilkinson and Edinger (2009) citations should be Gilkinson and Edinger (eds.) (2009).
- As different types of benthic communities are sensitive to different types of disturbance, this should be discussed and summarized in a table for easy reference and decision-making.
- Regarding the statement, “...and DFO and NAFO RV surveys...” “...visual assessments also poorly...” What is meant by ‘visual assessments’ here?
- Regarding the statement, “It is also important to note that characterizations of benthic communities are also inevitably biased according to sampling method. For example, visual assessments often poorly assess infaunal communities whereas grabs may have challenges sampling communities over harder substrates.” It should also be noted that bottom trawls typically sample only a small fraction of resident benthos, and most often larger epibenthos.
- The statement, “Collectively, these studies confirm that benthic communities in the SEA Study Area are quite diverse compared to higher trophic levels, as well as being somewhat sensitive to anthropogenic effects...”, requires qualification. When speaking in terms of sand-dominated continental shelves, the global literature on fishing-impacts in these habitats indicate that, in many cases, recovery can be relatively rapid (e.g. months). However, in deep-water slope environments inhabited by slow growing, long-lived corals and sponges, recovery could be measured in terms of decades in many cases, if not longer (Gilkinson and Edinger (eds.)(2009)).
- Further to the statement, “Perhaps the most holistic sampling was done on the Grand Banks as part of a series of trawling impact studies (Prena et al. 1999; Kenchington et al. 2001)”, it should be noted that these researchers used video and grabs (Kenchington et al 2001) and a benthic sled and trawl bycatch (Prena et al. 1999).
- Table 4.58 – Some non-shellfish species (e.g., sea urchins, polychaetes, sponges etc.) are included in this table summarizing shellfish species.
- Table 4.58 – Regarding the statement, “Spat settle primarily between August and November at depths of 10-15 m.”, it should be noted that they also settle in deep offshore water – primarily gravel, on Grand Bank (Gilkinson and Gagnon, 1991).
- Table 4.58 – Information on ‘Pale Sea urchin’ should reference Gagnon and Gilkinson (1994).
- Table 4.58 – Information on ‘surf clam’ is incorrect. Surfclams (*Spisula solidissima*) are mostly confined to warmer waters, which on Grand Bank, is the Tail of the Bank and Southeast Shoal. The species that is harvested commercially north-east of this area is the Arctic surfclam (*Mactromeris polynyma*), with only sporadic occurrences of *S. solidissima*.

- Table 4.58 – Information on Polychaete worms indicates that they occur on a variety of substrates. However, much of the Grand Bank is comprised of sandy sediments which support abundant and diverse populations (documented by Kenchington *et al.*, 2001).
- The statement, “*Studies to date indicate that, like fish, benthic assemblages respond to environmental variables such as depth, substrate and flow field (Houston and Haedrich 1984; Schneider et al. 1987).*”, requires addition of the following references related to Grand Banks benthos: Gilkinson and Gagnon, 1991; Gilkinson, 2013; Gale *et al.* (in press).
- Amphipod prey includes much more than just seaweed and phytoplankton. They have many diverse and ecologically important feeding modes. Many are scavengers and some are aggressive predators.
- Polychaete information is not comprehensive. The available literature should be used to provide data on diet and ecological roles of these important members of the benthos.
- The statement, “*Collectively, sea pens, soft corals, stony corals, and sponges are represented across the shelf, slopes and banks of the Study Area but are found at their highest densities along the slopes, i.e. depths > 200 m.*”, requires addition of references Wareham and Edinger (2007); Wareham (2010).
- The statement, “*Sponges, in contrast are more widely distributed and high densities can be found along the eastern slopes of the Grand Banks, around the Flemish Cap and along the northern slopes of the SEA Area*”, requires a reference.
- Regarding the statement, “*In response to the known sensitivity of coral and sponge grounds, many important coral and sponge areas have been designated as Vulnerable Marine Ecosystems (VMEs) (DFO 2012b) and are protected from damaging fishing activities in Canadian and NAFO waters.*”, it should be noted that with the exception of a portion of the southwest Grand Banks slope closure, these fishing closures occur in the NAFO regulatory area outside Canadian waters.
- Table 4.61 – The final column of this table is difficult to read. The number of digits after the decimal is inconsistent and the information is center justified, both of which are inappropriate formats for displaying such data. A right justified and constant number of digits after the decimal (suggested one digit past the decimal to be sufficient for “summary” statistics where precision is unwarranted) is more appropriate.
- Figures 4.70 and 4.71 – The time period covered by the coral and sponge RV records should be stated in the figure titles.

Section 4.2.1.6 – Marine Fish

- Table 4.62 and 4.63 – Tables are listed alphabetically by species. The order of the species should be taxonomic to permit grouping of species into various logical ecological groups.
- Table 4.62 – There is a notable lack of the most recent publications describing feeding habits and distribution and abundance trends of the three wolffish species found in the study area. The following references should be included in the descriptions for Atlantic Wolffish, Northern Wolffish, and Spotted Wolffish: Simpson *et al.* (2013); Collins *et al.* (2014).
- Table 4.62 – Atlantic Wolffish Habitat and Distribution – Wolffish are found over a variety of substrates (not just “hard clay bottom”), and at depths less than 25 m, and in excess of 250 m.
- Table 4.62 – That Atlantic Wolffish can be retained under SARA, unlike the other two wolffish species, deserves mention, even if this species is not “commercially significant”.

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- Table 4.62 – Include fish species as an important component of Cusk diet (Bowman *et al.* 2000). Also include that Cusk is monotypic species in the Northwest Atlantic.
- Table 4.62 – The statement, “A number of research initiatives have also characterized benthic communities on the Grand Banks (Schneider *et al.* 1987; Kenchington *et al.* 2001)”, should include the following references Gilkinson, 2013; Gale *et al.* (in press). Gilkinson (2013) documents benthic communities over areas of the Grand Bank as part of the DFO NL NEREUS Ecosystem Research Initiative, which involved a 3-year grab sampling program during multispecies trawl surveys. Gale *et al.* (in press) describe seastar (Asteroidea) assemblages and habitat use over wide areas of the eastern Canadian continental shelf and slope based on DFO survey trawl bycatch records and ROV video.
- Northern Wolffish – The statement “...occurs in Arctic seas on both sides of the North Atlantic Ocean” should be rewritten. Northern Wolffish occurs in both Arctic and Atlantic Oceans, as do other wolffish species – though no mention of this is made. The fact that Northern Wolffish is more pelagic than the other two species should also be noted.
- The statement that Northern Wolffish is distributed as a ‘widespread self-assemblage’, is incorrect. Northern Wolffish are mostly found along the shelf edge, not on the shelf.
- It should be included that, in the past, redfish larvae dominated the ichthyoplankton in many parts of the SEA area (Serebryakov *et al.* 1987).
- The introduction of invasive species and changes to habitat and/or community structure should also be discussed in the context of cumulative effects.
- The statement, “A total of four invertebrate taxa (snow crab, northern shrimp, pink striped shrimp, and shrimp *Pandalus propinquus*) were available from the Canadian Research Vessel surveys (Table 4.60)”, requires clarification. These are the major commercial species; however many other non-commercial taxa have been processed using standardized protocols during RV surveys since 2005/2006. The point of availability is inaccurate.
- Roughhead Grenadier – The reference Lorance *et al.* (2008) is relevant to the Northeast Atlantic only. A publication by Edinger *et al.* (2007) contains information on Roughhead Grenadier in NL waters. Specifically, it reports that Roughhead Grenadier were found in association with deep-sea corals, such as gorgonians, antipatharians, and soft corals at depths of 200-1000 m.
- Roundnose Grenadier – The reference Lorance *et al.* (2008) is relevant to the Northeast Atlantic only. In the Northwest Atlantic, the species has been caught at depths less than 400 m. The data provided for NL comes from Parsons 1976. Newer information is available in Power and Maddock-Parsons (1998), and Kulka (2001). Most catches of this species occurred at depths of 900 m or more.
- Spotted Wolffish – Spawning in late autumn and early winter was suggested by Templeman 1966. A more recent publication (Templeman 1986) suggested mid to late summer spawning (July-August-Sept).
- White Hake – White Hake occur at depths much less than 200 m. On the western St. Pierre Bank, and southwest slope of the Grand Bank, they frequently occur at around 100 m (Han and Kulka 2007). Juvenile White Hake are commonly found inshore, and may even occupy estuaries. Reference to Longfin Hake (*U. chesteri*) is not appropriate.
- White Hake – Not all juvenile White Hake are pelagic. The juvenile stage of the life cycle is characterized by pelagic and (later) demersal components.

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- Winter Skate – Kelly and Hanson (2013) estimated that 40-70 egg cases are deposited each year. Also, cephalopods (squid) are an important component of the diet.
- Herring – The occurrence for this species has been recorded up to 450 m depth in multispecies surveys.
- Capelin – Capelin are found in 3NLOPs in spring RV survey. Include 3K and 2J from fall RV survey. Besides the RV trawl surveys, capelin distribution information is available from annual DFO acoustic surveys.
- Capelin – The information related to 'subsequently spent adults...' is incorrectly stated and cited. Spent females move out to deeper water after spawning on beaches/bottom sites. Those that survive eventually migrate to offshore feeding areas and likely aggregate with capelin that will be maturing and spawning next year. The timing, the route, and mechanisms used to migrate from coastal waters to offshore feeding areas have not been knowingly documented.
- Include cephalopods as a major component of the Shortfin Mako diet.
- Include reproduction of White Sharks via internal fertilization, with development characterized by aplacental viviparity (also known as ovoviviparity) with embryonic oophagy. See Saïdi *et al.* 2005.
- Table 4.54 – Capelin spawning on Southeast Shoal takes place in June, July. Capelin also spawn on the bottom in coastal waters.
- Table 4.54 – Capelin spawning time (cumulatively) on beaches and coastal bottom sites and the Southeast Shoal encompasses May, June, July, August.
- Table 4.54 – No corresponding footnote reference exists for superscript #4 (Atlantic Cod).
- Table 4.54 – Sandlance spawning season is winter (December-March) not June–August as indicated in the table.
- Table 4.65 – There is much accompanying text around this table related to the inflated representation introduced by comparing numbers among various body sizes (e.g., cod versus sand lance). It is agreed this is important and suggested a companion table be added which reports weight of catch by species rather than numbers to reflect the biomass of the various species in the SEA area.
- Sandlance – Table 4.65 states Sandlance constitute 6% of RV catch while the text states they constitute 30%.
- Sandlance – The report should include information regarding habitat usage of Sandlance, i.e., burrowing in substrate part of day; migrating vertically to feed; and no distance migrations as are closely associated with their habitat.
- Sandlance – It should be noted that inshore and offshore sandlance are two different species. The report should highlight which species is impacted by any proposed work.
- Atlantic Cod – Other than a line in one of the tables in this section of the report, there is no mention of Atlantic cod, despite the existence of a published Atlantic cod Recovery Potential Assessment in 2011 (DFO-CSAS).

Section 4.2.1.8 – Environmental Influence and Changes

- The section on Environmental Influence and Changes does provide some useful information on climate change in regards to fish and invertebrates; however, the context needs to be

improved with the addition of information of the role of the North Atlantic Oscillation (NAO) and more comprehensive text on climate change in general (either in the existing text or earlier in sections on the physical environmental setting).

Section 4.2.1.9 – Aquatic Invasive Species

- Table 4.67 – Green crab is also one of the few AIS which are known to destroy fish habitat (i.e., eelgrass), thereby affecting recruitment of some species (e.g., Morris et al 2010).

Section 4.2.1.10 – Ecologically and Biologically Significant Species (EBSAs)

- The recent identification and description of additional EBSAs in the NL Shelves area (DFO 2013) is mentioned, but has not been adequately incorporated into this report. The data layers for these EBSAs can be provided upon request. Notably, The Orphan Spur EBSA, and possibly the edge of the Notre Dame Channel EBSA, overlap with the study area.
- Ecologically and Biologically Significant Areas (EBSAs) – *Southeast Shoal and Tail of the Banks* – It should also be noted here that the Southeast Shoal is an area with some of the highest (if not the highest) benthic biomasses recorded anywhere in the world due to the standing biomass of populations of the Arctic wedge clam, *Mesodesma* sp.
- Figure 4.89 – It is unnecessary for EBSAs outside the Eastern NL SEA boundaries to be included.

Section 4.2.1.11 – Other Ecologically Important Areas

- Figure 4.90 – Ecologically Important Areas Identified in the Orphan Basin SEA (2003). The color designation for the Orphan Basin area should be a darker shade to differentiate from the surrounding area.
- Legends provide a color scheme for abundance/biomass/species richness in Figures 4.91-4.93. It is not indicated how these were derived. No units are shown.

Section 4.2.3 – Marine Mammals and Sea Turtles

- Given the objectives of the SEA, the document is generally well written as it pertains to marine mammals. However, similar to other sections in the document, this text also lacks synthesis and integration of information from a trophic dynamics and changing marine environment perspective. Where possible this deficiency needs to be addressed (particularly in the case of threatened and endangered species).
- In either the Introductory paragraph on Mysticetes (4.2.3.1) or in the supporting tables (under Foraging Strategy and Food Sources), additional text is required to emphasize that these species migrate into our waters to feed for a limited amount of time on relatively specific prey species that are densely aggregated with variable distribution and abundance. As the information is presented now, these key ecological factors do not receive the attention required.
- There is no mention in any of the tables or Introductory paragraphs for either Mysticetes or Odontocetes that most of these species have complex social structures and communication systems. Although group size is mentioned in the tables, this doesn't adequately highlight these important behavioral traits.
- The information on Pinnipeds (Section 4.2.3.3) needs to be expanded so that harp seals, hood seals and grey seals are treated separately in the summary table (i.e. in the same manner key whale species were addressed). Although there are similarities in the ecology of harps and hoods, there are enough differences that lumping both species together results in a summary table with content that is too general to be useful. The timing and use of ice

habitat for whelping needs to be a focus for each of these two species. There is also a climate change aspect that should be presented and discussed (there is published literature on this topic as well as new information becoming available pers. comm. Garry Stenson). Note that a recent publication on satellite movements of hooded seals indicates that there is significant feeding along the shelf edge to the east of the 'Northeast Shelf Slope' EBSA (Anderson *et al.* 2012).

- Note that there are likely harbour seals present along the southern shore of the Avalon Peninsula for most of the year in addition to the Bays along the south coast.
- In March 2014 the Convention on Biological Diversity conducted a science advisory workshop to delineate EBSAs in the Northwest Atlantic Area, including areas beyond the 200mile limit. The shelf break area from the vicinity of Lilly/Carson Canyon extending northward to approximately 48° N was identified as a potential EBSA and further emphasizes the biological importance of this slope habitat.

Section 4.3 – Human Activities (4.3.4 Marine Fisheries)

An incomplete (and potentially misleading) description of fishing activities exists in the SEA. Virtually the entire section related to marine fisheries within the current SEA is constructed on the basis of Canadian fisheries, or foreign fisheries which land their catches in Canadian ports. This view of the fishing activities that take place in the SEA study area is limited and incomplete. The entire section related to this topic suggests a distribution of fishing activities that omits entirely the international fisheries operating outside the EEZ managed by NAFO, and therefore most of the maps could mislead an uninformed reader to believe, for example, that there is essentially no fishing going on in the Flemish Cap, or that the Sackville Spur has no fishing whatsoever, when in reality this is one of the areas in the region that has the highest levels of fishing-effort (e.g., NAFO 2012a).

Explicitly, it is not implied that these omissions and shortcomings are intentional, but it is highlighted that they effectively render the entire analysis of marine fisheries useless. The SEA states, "*Although the DFO datasets are known not to be comprehensive, particularly with regard to important inshore fisheries, the information provides a useful regional picture of fishing activity in the area that is considered adequate and appropriate for the purposes of the SEA*". However, this cannot be assumed true. Offshore, without integrating the information from Canadian and international fisheries it is impossible to assess if the picture provided is adequate and appropriate. As such, the entire section on marine fisheries should be redone to incorporate international fishing effort data. These data, in aggregated format, could be requested from the NAFO Secretariat. Note also that Campbell and Feridzon (2013) provide data for fishing vessel activity in the areas governed by NAFO for 2011 and 2012.

To permit a general visual comparison of fisheries activities in the study area with and without inclusion of NAFO data, see Figure 1; Appendix 1 that compares Figure 4.122 from the SEA report (commercial fishing locations in 2008-2012) and Figure 4.2.2.1.7 from NAFO (2012a) (common fishing effort areas derived from VMS data in 2008-2011). Such information should be combined with the fishing effort information from DFO to provide a complete picture of fishing in the SEA area.

Section 5 – Environmental Interactions, Mitigation and Planning Considerations

In general, with regards to environmental interactions, mitigation and planning considerations, the report presents an overview of some of the possible interrelationships resulting from potential offshore oil and gas activities on the Grand Bank and adjacent areas (e.g., Table 5.1) by listing the major activities related to seismic surveys, exploration, drilling and production activities, and how these activities might potentially impact fish and fish habitat, while

considering results from previous studies and other sources of available information. However, some areas remain vague in this regard, as do many of the environmental mitigation measures.

Section 5.1 – Fish and Fish habitat (effects assessment)

- This section is a weak summary of other summaries. It is not comprehensive and will not serve as a useful reference. Our understanding has changed dramatically with the research following the Macondo blowout. This should be reflected in this summary.
- Table 5.1 – Information in the table is not adequate. The table is incomplete and often cites reviews of reviews. It is noted in the header that the table is a “*Summary of Some Known and Potential Environmental Effects Based on Available Information Sources*”. This implies that a thorough job of reviewing and summarizing the existing literature for this aspect of the report was not undertaken.
- Table 5.1 – It should be noted that accidental spills of oils or other substances onto the Southeast Shoal during the period capelin are spawning, eggs are incubating, and yolk sac larvae are in the sediment could have a negative impact on that year class and subsequent spawning biomass.
- The bullet, “*Changes in the presence, abundance, distribution and/or health of fish and invertebrates...*” is vague. Direct mortality of marine organisms (at various stages of development) resulting from exposure to oil spills should be stated explicitly instead.
- Produced water effects should include increased nutrient loading and the ecosystem consequences for benthic pelagic coupling and production (Rivkin *et al.* 2000).
- Tannen *et al.* (2nd line) is cited incorrectly. The effects found relate to increased oxygen demand not oxygen enrichment. Produced water effects in this section are related to discharge not flaring. Rye *et al.* (2003) is not in the list of references.
- Mitigations for ballast water introduction of invasive species are included, but not for fouling organisms on hulls, drilling rigs or equipment. Protocols for mitigation of these introduction vectors should also be included in this section.
- It is indicated that the Southeast Shoal is a nursery for yellowtail flounder. However, it should also be acknowledged that the Southeast Shoal is the only spawning site for the Southeast Shoal capelin stock.
- The report suggests ‘*avoiding species at risk where possible during the planning and conduction of oil and gas activities in the offshore*’ as a mitigation procedure. However, since the three wolffish species are found throughout the study area, no practical avoidance exists. What should be a practical mitigation measure in the case of wolffish or white sharks?
- There are no considerations in the report regarding accidental oil spills vis-à-vis fish species at risk and their habitat. This study includes the spatial distribution of abundance indices for the three wolffish species; and potential spatial and temporal trajectories of oil spills have been modelled and/or simulated in previous studies (e.g. Net Environmental Benefit Analysis of Dispersant Use for Responding to Oil Spills from Oil and Gas Facilities on the Newfoundland Grand Banks, 2013); both sources of information could be used to assess the impact of oil spills on the wolffish populations components found in the study area and could also be used as a framework for identifying appropriate mitigation measures in the case of oil spills.

Section 5.3 – Marine Mammals and Sea Turtles (Effects Assessment)

This section of the document is generally well written as it pertains to marine mammals given the objectives of the SEA. However, it is noted the sections on Important Areas and Times for each of the key VEC species groups (e.g. Marine Mammals and Sea Turtles - 5.3.3.2) have considerable repetition from earlier sections of text. While some of this is warranted, there should also be an effort to link this information with the appropriate mitigation measures presented in each of the preceding sections of text.

- The risk from ingestion of floating debris (i.e. plastic bags) for turtles should be discussed and garbage management and onshore disposal proposed as mitigations.

Section 5.4 – Sensitive and Special Areas (Effects Assessment)

- The effects of drilling wastes on sensitive and sessile benthic species such as corals and sponges are not well understood. However, since they are filter feeders and known to be sensitive to increased sedimentation, organic matter loading, and quality of suspended particulate material, it can be anticipated that they will be negatively affected. There is also very little information on the potential effects of seismic exploration on these organisms. These aspects should be highlighted as a critical information gap within this consideration of sensitive and special areas.
- The mitigation for cumulative effects is to reduce overlap of projects. This is not realistic. Overall this section is inadequate and does not summarize or address the potential for cumulative effects. It should include interactions between activities as well as thresholds for effects and consider climate, habitat and foodweb change as possible drivers.
- This section implies that only designated VMEs and Coral Areas will be considered in this section. Other coral and sponge populations are only briefly referred to in the ecosystem overview and generally ignored in the assessment of potential effects.

Section 5.6 – Cumulative Environmental Effects

This section is very superficial as presented. It is noted within the report that information on cumulative effects is undeveloped here because upcoming projects and their footprints are unknown. However, there is also no attempt to describe how cumulative effects are currently being assessed nor is there acknowledgment and discussion regarding the advancements in cumulative effects research in recent years. These issues need to be addressed.

Specifically regarding the issue of unknown projects and unknown project footprint sizes as an explanation for providing no relevant industry information, it is noted that it is indicated elsewhere in the current SEA and on the C-NLOPB website that up to ten Environmental Assessments for petroleum exploration/production activities are in progress. At the very least, an overview and time line of these activities should be presented here.

Note: DFO conducted a National Science Advisory Process to develop a new framework for large project cumulative effects on marine mammals in March 2014 – contact J. Lawson for details on when this information will become available.

Section 5.7 Information Availability, Requirements and Opportunities

Coral and sponge effects and sensitivity should be identified as a significant information gap.

CONCLUSION

In conclusion, the quality of scientific content presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the document can be considered a reliable source of guidance for policy and management decision-making.

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April 24, 2014

Sources of information

This Science Response Report results from the Science Response Process of April 2014 for the Science Review of the Eastern Newfoundland Strategic Environmental Assessment (SEA).

Additional publications from this meeting will be posted on the (DFO) Science Advisory Schedule as they become available.

Andersen, J. M., Wiersma, Y. F., Stenson, G. B., Hammill, M. O., Rosing-Asvid, A., and Skern-Mauritzen, M. 2013. Habitat selection by hooded seals (*Cystophora cristata*) in the Northwest Atlantic Ocean. – ICES Journal of Marine Science, 70:173–185. Baillon S., Hamel, J-F, Wareham, V. E., and Mercier, A. 2012. Deep cold-water corals as nurseries for fish larvae. Front Ecol Environ 2012; doi:10.1890/120022.

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Appendix 1: Figures

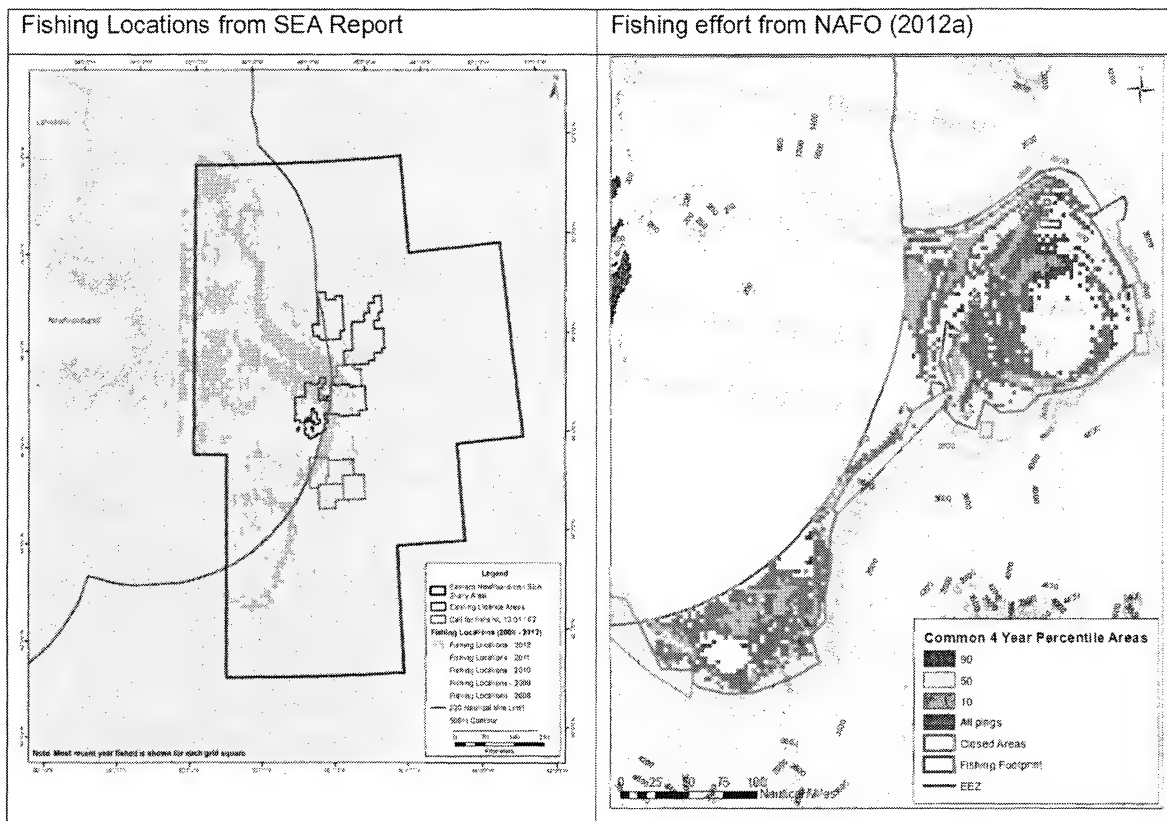


Figure 1. Comparison of Fishing Locations mapping from the Eastern Newfoundland SEA (Figure 4.122 from the SEA report- commercial fishing locations in 2008-2012-) and common fishing effort areas in the NAFO Regulatory Area in 2008-2011 derived from NAFO VMS data (Figure 4.2.2.1.7 from NAFO (2012a)).

This Report is Available from the

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ISSN 1919-3769

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Correct Citation for this Publication:

DFO. 2014. Science Review of the Eastern Newfoundland Strategic Environmental Assessment
(SEA). DFO Can. Sci. Advis. Sec. Sci. Resp. 2014/nnn.

Aussi disponible en français :

SCIENCE REVIEW OF THE EASTERN NEWFOUNDLAND STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

Context

Since 2002, the C-NLOPB has been conducting Strategic Environmental Assessments (SEAs) of portions of the Newfoundland and Labrador Offshore Area that may have the potential for offshore oil and gas exploration activity. SEA is a broad-based approach to environmental assessment that examines the environmental effects which may be associated with a plan, program or policy proposal and that allows for the incorporation of environmental considerations at the earliest stages of program planning. SEA typically involves a broader-scale environmental assessment (EA) that considers the larger ecological setting, rather than a project-specific environmental assessment that focuses on site-specific issues with defined boundaries. Notably, the accuracy of information in a SEA is especially important as it sets the basis for future project-specific EA within its study area.

On March 5, 2014, The Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) released the Draft Eastern Newfoundland Strategic Environmental Assessment (SEA) Report for public comment.

The Environmental Assessment and Major Projects (EAMP) Division of the DFO Ecosystems Management Branch in the Newfoundland and Labrador Region requested that DFO Science undertake a review of this document, and specifically the information put forward in the SEA on the (physical and biological) Environmental Setting: Section 4.1.4 (Oceanography); Section 4.1.5 (Ice conditions); Section 4.2.1 (Fish and Fish Habitat); Section 4.2.3 (Marine Mammals and Sea Turtles); Section 4.2.4 (Sensitive and Special Areas); as well as that on Environmental Interactions, Mitigation and Planning Considerations (i.e., the effects assessment): Section 5.1 (Fish and Fish Habitat); Section 5.3 (Marine Mammals and Sea Turtles); and Section 5.4 (Sensitive and Special Areas).

Given the short timeline to carry out a review, a DFO Science Response process was undertaken. Science expertise within Fisheries and Oceans, Newfoundland and Labrador Region was solicited to address this review – although the provision of feedback was limited to the areas of the report where expertise was available at the time of the review, including that from Ecological Sciences, Marine Mammals, Marine Fish Species at Risk and Pelagic Sections.

The review found that overall the quality of scientific information presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the final document can be considered a reliable source of guidance for policy and management decision-making.

This Science Response Report results from the April 2014 Science Response Process of for the DFO Science review of the “*Eastern Newfoundland Strategic Environmental Assessment (SEA) (AMEC November 2013)*.” The report is a summarization of the comments provided by DFO Science Branch, Newfoundland and Labrador Region, to the Marine Habitat Protection Section on the above noted sections, as well as other parts of the document with appropriate linkages to those.

Analysis and Response

General Comments

- As the *Eastern Newfoundland Strategic Environmental Assessment* is intended to identify and incorporate environmental considerations at the earliest stages of planning and decision making, it is expected to be broad in its scope, and relatively general in its description of potential impacts associated with oil and gas exploration and/or production in the region within the next decade. However, specific details still remain important in many regards as it is fundamental that the SEA provides a complete and comprehensive system-wide perspective in order to be useful for future project-specific EAs.
- Much of the information describing the existing environment is reasonably complete for the area of the SEA that falls inside the 200 mile limit. However, specific information for the offshore (>200 miles) portion of the study area, and in particular the Flemish Cap and Orphan Basin, is lacking. This is largely attributable to lack of consideration of fishing and research data from NAFO sources and is considered a major weakness in the accuracy of the assessment.
- The SEA is lacking a comprehensive overview on climate change in its description of the physical environment. Only a few statements regarding climate change exist throughout, with nothing substantive reported. Information taken from existing models and the most current projections should be presented for key physical indices where available.
- The SEA does not adequately capture the complexity of the biological environment of the study area. The report does not describe functional ecosystem units or attempt to analyze impacts on their structure and function; but rather simply provides a list of components and compiles potential effects on them, as opposed to on the system as a whole. While this type of description is useful, it is not complete, and carries the risk of promoting “tunnel vision” approaches to management issues.
- The SEA is lacking in its consideration of important aspects of the ecosystem such as trophic structure, ecoregion configuration, linkages between the Grand Bank and the northern Newfoundland shelf, and bottom up regulation of ecosystem productivity – all of which are key to understanding the existing environment and potential interactions.
- The SEA provides incomplete descriptions of Vulnerable Marine Ecosystems (VMEs), and is lacking adequate information for characterization of VME indicator species, including their distribution and the potential impacts of oil and gas exploration/production and spills on these.
- The SEA consideration of potential environmental effects is basic at best, failing to synthesize the current understanding of potential effects. This is also the case for the sections on interactions with other human activities including fishing and sensitive and special areas. The potential for cumulative effects is mentioned in the report, but is not developed.
- The SEA contains data sets that appear to be dated (e.g., DFO fish survey data up to 2009; Sea Ice Atlas to 2010; some tropical storm data to 2000; MSC50 wave/current data to 2011; etc.) While it is understandable that some data sets may not be available after a certain date; it is, however, likely that some are available in an updated format (e.g., the most recent tropical storm data). As such, if a data set is ‘prematurely’ truncated or not being used for some reason – it should be stated as clarification within the report. Also, if there are additional data expected, it should be noted when they are likely to become available.

Specific Comments

Section 3.2 – Generic Description of Offshore Oil and Gas Activities

- Primary emissions from offshore production should explicitly list produced water since it is the largest waste stream from that activity.
- Spill data for NL offshore should be updated to include 2013. Spill discussion should also include that spills may be due to aging or leaky infrastructure.
- Oils spills scenarios under ice should be included in tables where available. Although they are mentioned as part of some of the studies, inclusion in the tables would prove useful.
- Table 3.4 – Numbers are not standardized per unit time or capacity; therefore, they are misleading. What are the “lifespans” of the wells in this table – i.e., how many of the 29,527 wells in the 1980’s were also operational in the 1970’s (and hence double counted)? The total number operating during each period may reduce the apparent blowout frequency by referencing existence in more than one of the time periods. The number of operating wells in 1971-80 plus the number of “new wells” minus the number of “decommissioned wells” would be a more meaningful number in this column in this comparison. The number of exploration vs. production wells would be very revealing also. It is suggested that revising the blowout instances per unit time of well operational life would be more informative than the numbers currently reported.
- Table 3.8 – Comments in the text related to the table suggests that 2% is some form of benchmark for oil spill dispersion rate. It is not clear what is the basis for reliance on such a number, what the reference authority for this number is, and whether it is an ecologically useful number.

Section 4.1 – Physical Environment

It is notable that the description of the physical environment lacks a comprehensive overview on climate change. While there are a few statements regarding climate change, nothing substantive is reported. This needs to be included in the SEA. In this, the document should include general information on the most current projections relative to air and sea temperatures, currents, primary productivity and changes in frequency of extreme weather based on regional climate change models. This would include consideration of which models are considered best right now for the study area in question; and data gaps and key uncertainties. These projections should be also be integrated into subsequent areas of text throughout the SEA as required (e.g. the sections on ice and ice bergs as well as in the species accounts where information is available).

Section 4.1.1 – Geology

- Note that multiple references for Piper (pers. comm.) exist in this section. Since this is an area of active research, and since the SEA is a living document, this section should be updated on a priority basis as the research is published.
- The explicit risk of a landslide (1/500) is included in the SEA, yet the risks for other geohazards are not specified. This is also reported as a personal communication which may not be particularly useful for future planning. This section should be updated to include the anticipated report from Natural Resources Canada that contains slope failure risk maps. This would provide operators with useful information at the planning stages.
- A map of the features of the Orphan Basin described in this section should be included. They are not in Figure 4.3.

Section 4.1.2 – Bathymetry

- As knowledge of bathymetry is important to understanding many key aspects of the physical and biological environment, it would be helpful to include major bathymetric contours/features in a clear manner on all maps depicted within the report (e.g., Figure 1.1), similar to that in Figure 2.2. Otherwise, maps provide very little frame of reference.
- Figure 4.6 – The figure should indicate in title or legend that bathymetry is in ‘m’.

Section 4.1.3 – Climatology

- Precipitation figures need a better explanation for the y-axis indicating whether the frequency of occurrence (%) refers to event duration per month or number of events per month or per day.
- The data for frequency of thunderstorms looks odd. Figure 4.26 shows a big spike in July while Figure 4.28 has a big dip in September. Could these be the result of calculation errors? Since this is a 63-year climatology it should not be related to sample size and interannual variability.

Section 4.1.4 – Oceanography

- The description on extreme wind and wave events partially captures the level of integration and comprehensiveness that is required to make all the information presented useful. However, it is problematic in that it lacks a climate change context.

Section 4.2 – Biological Environment (4.2.1 Fish and Fish Habitat)

A poor description of the ecosystem structure in the study area exists in the SEA. The SEA study area actually expands over at least four different functional ecosystem production units: a) the Grand Bank, b) the Newfoundland-Labrador Shelf, both of them part of the Newfoundland-Labrador Shelves marine ecosystem, c) the Flemish Cap, which is considered a relatively closed marine ecosystem, and d) the oceanic waters beyond the continental shelf break. Furthermore, it includes the transition areas between these ecosystems, and given the large range in depths involved in SEA study area, it can also be argued that it expands over bathypelagic and abyssal oceanic ecosystems. These very basic descriptions, and their potential implications, are currently absent, and need to be incorporated in the SEA.

It should be noted that the basic ecoregion structure in the Grand Bank indicates that the Grand Bank and the Labrador-Newfoundland Shelf can be considered ecosystem sub-units, where the northern Grand Bank (NAFO Division 3L) acts as a transition zone between these subunits. It is also clear the existence of a distinct shelf-break ecoregion, which acts as a transition zone (ecotone) between shelf and oceanic realms (Pepin *et al.* 2010, NAFO 2010b, 2012a). The Flemish Cap also emerges as a distinct ecosystem production unit (Perez-Rodriguez *et al.* 2010, NAFO 2010b), and both The Grand Bank and Flemish Cap are being among considered the candidate ecosystem management units being considered for the development of an ecosystem approaches to fisheries by NAFO (NAFO 2010b).

Although the Newfoundland-Labrador Shelves and Flemish Cap have experienced collapses of major groundfish components, and share many of their core species, the structure of these ecosystems is not identical. For example, the key forage species in the [southern] Grand Bank are sandlance and capelin, shrimp and capelin in the [northern] Newfoundland-Labrador Shelf, while in the Flemish Cap redfish and shrimp have been key prey species for that ecosystem (NAFO 2010b, 2011, 2012, Perez-Rodriguez *et al.* 2011, 2012). Furthermore, in the NL shelves, there is evidence of bottom-up regulation of capelin, its overall core forage fish species, with linkages between environmental drivers (e.g. ice dynamics), phytoplankton blooms, zooplankton

abundance, and capelin dynamics (DFO 2012, Buren *et al.* 2014), and where the dynamics of upper trophic levels (e.g. Atlantic cod) seem to have been driven by availability of food (capelin) and fishing (DFO 2012, Buren *et al.*, submitted). The influence of ice dynamics on ecosystem trends is not observed in the Flemish Cap (NAFO 2011), where besides the impact of fishing, environmental drivers seem to be influencing recruitment success, while predation by top predators appears to regulate the dynamics of juvenile and smaller fishes (Perez-Rodriguez *et al.* 2013), and where strong trophic interactions are linking the core species (cod, redfish and shrimp) in the Flemish Cap ecosystem (NAFO 2011, 2012a).

The above highlights that while the basic ecosystem organization and dynamics that exists in the SEA study area is not described by the SEA document, there are analyses and information available to produce the strategic/broad base description that could provide managers/decision makers with a more functional and holistic perspective of the ecosystems that are potentially affected by oil and gas development.

Section 4.2.1 – Fish and Fish Habitat

- The report provides a comprehensive review of the biology, ecology, distribution and general aspects of the life history of several relevant fish species inhabiting the Grand Bank and southern Labrador shelf. In general the data shown in the Figures and Tables are accurate and informative, and the references cited in the report are generally up to date, with a few exceptions. An interesting aspect of this report is the integrated approach used to describe fish habitat and how it varied temporally and spatially, including the interrelationships of the various trophic/ecological components.
- The SEA contains only partial survey information and exhibits a lack of understanding of the limitations of the DFO trawl surveys. It is notable that the SEA only considers research survey information from DFO, but survey programs conducted by the European Union (EU), and/or some of its member states, exist. These research surveys, focused on the Flemish Cap, but also on the nose and tail of the Grand Bank, are routinely used by NAFO Scientific Council to assess fish stocks in the area, as well as ecosystem structure and interactions. Numerous NAFO documents and papers describe and analyze data from these surveys (e.g. NAFO 2010a, 2010b, 2011, 2012a, Perez-Rodriguez *et al.* 2011, 2012, Nogueira *et al.* 2013).
- While the SEA mentions the changes in areal coverage and gear in the DFO surveys referenced (page 161), it also indicates that 4 invertebrate species had passed its screening process – failing to recognize that only shrimp and crab have been consistently recorded in DFO surveys since the switch to the Campelen gear in 1995-1996. As such, it is actually impossible to establish if other invertebrates (e.g. brittle stars and/or sea urchins, among others) could have met or not the SEA screening criteria. It should be noted, however, that consistency in the recording of invertebrates in DFO surveys has been improved in recent years, and as part of the DFO Ecosystem Research Initiative (ERI) NEREUS Program during 2007-2010, a grab sampling program was implemented in soft bottoms of the Grand Bank (e.g. DFO 2012, Gilkinson 2012). These results should be included in the SEA.
- An incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species exists in the SEA. Over the last 5-7 years, there has been increased research effort devoted to the identification, characterization, and mapping of Vulnerable Marine Ecosystem (VME) indicator species within the SEA study area. Most of this work has been done under the umbrella of NAFO, and through the NAFO Scientific Council (SC) Working Group on Ecosystem Approaches to Fisheries Management (WGEAFM; recently been renamed SC Working Group on Ecosystem Science and Assessment (WGESA)). Most of this work is not included or mentioned in the current SEA. Furthermore, some recent and

relevant studies like Baillon *et al* (2012) and Beazley *et al* (2013) are referenced in the text, but absent in the references section, and some of their implications not included in the document. For example, Baillon's study documents the linkage between seapens (corals) and redfish larvae, and makes the case for seapen fields to be considered essential fish habitat for redfish. This potentially critical role of seapen fields for redfish is absent from Table 4.62 (overview of key groundfish species in the SEA area), and there is no mention of this linkage in Table 5.1. (fish and fish habitat potential environmental interactions).

- It should be noted that sponge grounds are among the more abundant VME indicator species in the SEA study area, but little attention is paid in Table 5.1. to the impacts of potential spills on these large grounds of filter-feeding, habitat forming species; and the spill simulations described in SEA seem to focus on either shoreline/surface impacts or highlights that spills will drift east (beyond 50°W). No attempt to assess the impact of these trajectories on VMEs exists in the current SEA, even though potentially damaging biogenic essential fish habitat could have serious long term impacts on ecosystem productivity.
- Although corals and sponges have been the initial focus in the study of VMEs, many other taxa have been identified as VME indicator species, including tube-dwelling anemones, erect bryozoans, and crinoids, and several physiographic features (e.g. seamounts, canyons, the Southeast shoal) have been identified as VME elements because they contain (or are likely to contain) VMEs (NAFO 2012). These other VME components are not discussed in any detail in the SEA, nor is an assessment of the potential impact of oil and gas exploration/production on them considered.
- Many of the NAFO reports from the Scientific Council meetings since 2008, and the reports from the SC WGEAFM (and references within) summarize most of the available information on VMEs in the SEA study area. These reports should be used not just to describe what is known on VMEs, but also to inform/construct scenarios for spill simulation studies.
- Although not yet available, the upcoming NAFO SC WGESA report (to be released in May 2014) will also contain an updated summary on VMEs, and an analysis of adequacy for current NAFO VME closures. This report will also contain recent findings that suggest that VME areas may be linked to higher fish densities, highlighting the potential importance of these areas for overall ecosystem production. Although it would have been impossible for the SEA drafting team to know these latest unpublished results when putting the SEA document together, the participation of NAFO within the SEA Working Group could have made them aware of this ongoing work, and possibly made available some of the preliminary results for the SEA drafting team.
- Another important source of information that would be useful for preparation of the final version of the SEA is the report of a Convention on Biological Diversity (CBD) Regional Workshop that took place in Montreal, on 24-28 March 2014 and was intended to facilitate the description of ecologically or biologically significant marine areas in the Northwest Atlantic. The international waters within the SEA study area were part of the area considered by this CBD workshop.

Section 4.2.1.3 – Plankton

- Plankton – The role of plankton in nitrogen and carbon cycling is not well explained. The term “biological pump” is misused. It does not refer to benthic pelagic coupling (which is an important process and should be explained) but rather to the sequestration of biogenic carbon in the deep ocean.

- The causal mechanisms of the spring bloom are incomplete. Onset of stratification and the interaction with light availability are key factors. Incorrect use of the term “biological pump” occurs in this section.

Section 4.2.1.4 – Plants and Microalgae

- Several important aspects of macroalgal communities are missing from the SEA. Several types of macroalgae, in particular coralline algae, have depth distributions well in excess of 30 m. Urchin-kelp-coralline algae dynamics are an important determinant of hard substrate communities in our waters (Himmelman and Steele, 1971). The substrate of the Grand Banks has been greatly disturbed by trawling which may affect the distribution of macroalgae. Fishing exclusion zones and artificial reefs may change this and provide refuges for macroalgae. Seaweed zonation with light is an important determinant of distribution. Seaweed communities are vulnerable to oil spills. Therefore coastal seaweed communities and their structure and function should be included in this section.

Section 4.2.1.5 – Benthic Communities

- All Gilkinson and Edinger (2009) citations should be Gilkinson and Edinger (eds.) (2009).
- As different types of benthic communities are sensitive to different types of disturbance, this should be discussed and summarized in a table for easy reference and decision-making.
- Regarding the statement, “...and DFO and NAFO RV surveys...” “...visual assessments also poorly...” What is meant by ‘visual assessments’ here?
- Regarding the statement, “*It is also important to note that characterizations of benthic communities are also inevitably biased according to sampling method. For example, visual assessments often poorly assess infaunal communities whereas grabs may have challenges sampling communities over harder substrates.*” It should also be noted that bottom trawls typically sample only a small fraction of resident benthos, most often larger epibenthos.
- The statement, “*Collectively, these studies confirm that benthic communities in the SEA Study Area are quite diverse compared to higher trophic levels, as well as being somewhat sensitive to anthropogenic effects...*”, requires qualification. When speaking in terms of sand-dominated continental shelves, the global literature on fishing impacts in these habitats indicate that, in many cases, recovery can be relatively rapid (e.g. months). However, in deep-water slope environments inhabited by slow growing, long-lived corals and sponges, recovery could be measured in terms of decades in many cases, if not longer (Gilkinson and Edinger (eds.)(2009)).
- Further to the statement, “Perhaps the most holistic sampling was done on the Grand Banks as part of a series of trawling impact studies (Prena *et al* 1999; Kenchington *et al* 2001), it should be noted that these researchers used video and grabs (Kenchington *et al* 2001) and a benthic sled and trawl bycatch (Prena *et al* 1999)...”
- Table 4.58 – Some non-shellfish species (e.g., sea urchins, polychaetes, sponges etc.) are included in this table summarizing shellfish species.
- Table 4.58 – Regarding the statement, “*Spat settle primarily between August and November at depths of 10-15 m.*”, it should be noted that they also settle in deep offshore water, primarily gravel, on Grand Bank (Gilkinson and Gagnon, 1991).
- Table 4.58 – Information on ‘Pale Sea urchin’ should reference Gagnon and Gilkinson (1994).

- Table 4.58 – Information on ‘surf clam’ is incorrect. Surfclams (*Spisula solidissima*) are mostly confined to warmer waters, which on Grand Bank, is the Tail of the Bank and Southeast Shoal. The species that is harvested commercially north-east of this area is the Arctic surfclam, *Mactromeris polynyma*, with only sporadic occurrences of *S. solidissima*. Contact Elaine Hynick, Science Branch, DFO for more detailed information.
- Table 4.58 – Information on Polychaete worms, states that they occur on a variety of substrates. However, much of Grand Bank is comprised of sandy sediments which support abundant and diverse populations (documented by Kenchington *et al.*, 2001).
- The statement, “Studies to date indicate that, like fish, benthic assemblages respond to environmental variables such as depth, substrate and flow field (Houston and Haedrich 1984; Schneider *et al.* 1987).”, requires addition of the following references related to Grand Banks benthos: Gilkinson and Gagnon, 1991; Gilkinson, 2013; Gale *et al.* (in press).
- Amphipod prey includes much more than just seaweed and phytoplankton. They have many diverse and ecologically important feeding modes. Many are scavengers and some are aggressive predators.
- Polychaete information is not comprehensive. The available literature should be used to provide data on diet and ecological roles of these important members of the benthos.
- The statement, “Collectively, sea pens, soft corals, stony corals, and sponges are represented across the shelf, slopes and banks of the Study Area but are found at their highest densities along the slopes, i.e. depths > 200 m.”, requires addition of references Wareham and Edinger (2007); Wareham (2010).
- The statement, “Sponges, in contrast are more widely distributed and high densities can be found along the eastern slopes of the Grand Banks, around the Flemish Cap and along the northern slopes of the SEA Area”, requires a reference.
- Regarding the statement, “In response to the known sensitivity of coral and sponge grounds, many a number of important coral and sponge areas have been designated as Vulnerable Marine Ecosystems (VMEs) (DFO 2012b) and are protected from damaging fishing activities in Canadian and NAFO waters.”, it should be noted that with the exception of a portion of the SW Grand Banks slope closure, these fishing closures occur in the NAFO regulatory area outside Canadian waters.
- Table 4.61 – The final column of this table is difficult to read. The number of digits after the decimal is inconsistent and the information is center justified, both of which are inappropriate formats for displaying such data. A right justified and constant number of digits after the decimal (suggested one digit past the decimal to be sufficient for “summary” statistics where precision is unwarranted).
- Figures 4.70 and 4.71 – The time period covered by the coral and sponge RV records should be stated in the figure titles.

Section 4.2.1.6 – Marine Fish

- Table 4.62 and 4.63 – Tables are listed alphabetically by species. The order of the species should be taxonomic to permit grouping of species into various logical ecological groups.
- Table 4.62 – There is a notable the lack of the most recent publications describing feeding habits and distribution and abundance trends of the three wolffish species found in the study area. The following references should be included in the descriptions for Atlantic Wolffish, Northern Wolffish, and Spotted Wolffish: Simpson *et al.* (2013); Collins *et al.* (2014).

- Table 4.62 – Atlantic Wolffish Habitat and Distribution – Wolffish are found over a variety of substrates (not just “hard clay bottom”), and at depths less than 25 m, and in excess of 250 m.
- Table 4.62 – That Atlantic Wolffish can be retained under SARA, unlike the other two wolffish species, deserves mention, even if this species is not “commercially significant”.
- Table 4.62 – Include fish species as an important component of Cusk diet (Bowman *et al.* 2000). Also include that Cusk is monotypic species in the Northwest Atlantic.
- Table 4.62 – The statement, “A number of research initiatives have also characterized benthic communities on the Grand Banks (Schneider *et al.* 1987; Kenchington *et al.* 2001)”, should include the following references Gilkinson, 2013; Gale *et al.* (in press). Gilkinson (2013) documents benthic communities over areas of Grand Bank as part of the DFO NL NEREUS Ecosystem Research Initiative, which involved a 3-year grab sampling program during multispecies trawl surveys. Gale *et al.* (in press) describe seastar (Asteroidea) assemblages and habitat use over wide areas of the eastern Canadian continental shelf and slope based on DFO survey trawl bycatch records and ROV video.
- Northern Wolffish – The statement “...occurs in Arctic seas on both sides of the North Atlantic Ocean” should be rewritten. Northern Wolffish occurs in both Arctic and Atlantic Oceans – as do other wolffish species, though no mention of this is made. The fact that Northern Wolffish is more pelagic than the other two species should also be noted.
- The statement that Northern Wolffish is distributed as a ‘widespread self-assemblage’, is incorrect. Northern Wolffish are mostly found along the shelf edge, not on the shelf.
- It should be included that, in the past, redfish larvae dominated the ichthyoplankton in many parts of the SEA area (Serebryakov *et al.* 1987).
- The introduction of invasive species and changes to habitat and/or community structure should also be discussed in the context of cumulative effects.
- The statement, “A total of four invertebrate taxa (snow crab, northern shrimp, pink striped shrimp, and shrimp *Pandalus propinquus*) were available from the Canadian Research Vessel surveys (Table 4.60)”, requires clarification. These are the major commercial spp., however many other non-commercial taxa have been processed using standardized protocols during RV surveys since 2005/2006. The point of availability is inaccurate.
- Roughhead Grenadier – The reference Lorance *et al.* (2008) is relevant to the Northeast Atlantic, only. A publication by Edinger *et al.* (2007) contains information on Roughhead Grenadier in NL waters. Specifically, it reports that Roughhead Grenadier were found in association with deep-sea corals, such as gorgonians, antipatharians, and soft corals, at depths of 200-1000 m.
- Roundnose Grenadier – The reference Lorance *et al.* (2008) is relevant to the Northeast Atlantic only. In the Northwest Atlantic, the species has been caught at depths less than 400 m. The data provided for NL comes from Parsons 1976. Newer information is available, in Power and Maddock Parsons (1998) and Kulka (2001). Most catches of this species occurred at depths of 900 m or more.
- Spotted Wolffish – Spawning in late autumn and early winter was suggested by Templeman 1966. A more recent publication (Templeman 1986) suggested mid to late summer spawning (July-August-Sept).
- White Hake – White Hake occur at depths much less than 200 m. On the western St. Pierre Bank, and southwest slope of the Grand Bank, they frequently occur at around 100 m (Han

and Kulka 2007). Juvenile White Hake are commonly found inshore, and may even occupy estuaries. Reference to Longfin Hake (*U. chesteri*) is not appropriate.

- White Hake – Not all juvenile White Hake are pelagic. The juvenile stage of the life cycle is characterized by pelagic and (later) demersal components.
- Winter Skate – Kelly and Hanson (2013) estimated that 40-70 egg cases are deposited each year. Also, cephalopods (squid) are an important component of the diet.
- Herring – The occurrence for this species has been recorded up to 450 m in multispecies surveys.
- Capelin – Capelin are found in 3NLOPs in spring RV survey. Include 3K and 2J from fall RV survey. Besides the RV trawl surveys, capelin distribution information is available from annual DFO acoustic surveys.
- The information related to ‘subsequently spent adults...’ is incorrect and wrongly cited. Spent females move out to deeper water after spawning on beaches/bottom sites. Those that survive eventually migrate to offshore feeding areas and likely aggregate with capelin that will be maturing and spawning next year. The timing, the route, and the mechanisms used to migrate from coastal waters to offshore feeding areas have not been knowingly documented.
- Include cephalopods as a major component of the Shortfin Mako diet.
- Include reproduction of White Sharks via internal fertilization, with development characterized by aplacental viviparity (also known as ovoviviparity) with embryonic oophagy. See Saïdi *et al.* 2005.
- Table 4.54 – Capelin spawning on Southeast Shoal takes place in June, July. Capelin also spawn on the bottom in coastal waters.
- Table 4.54 – Capelin spawning time (cumulatively) on beaches and coastal bottom sites and the Southeast Shoal encompasses May, June, July, August.
- Table 4.54 – No corresponding footnote reference exists for superscript #4.
- Table 4.54 – Sandlance spawning season is winter (December-March) not June–August as indicated in the table.
- Table 4.65 – There is much accompanying text around this table related to the inflated representation introduced by comparing numbers among various body sizes (e.g., cod versus sand lance). Agreed this is important – suggested to add a Table be added as a companion table which reports not numbers, but rather weight of catch by species reflecting the biomass of the various species in the SEA area.
- Sandlance – Table 4.65 states Sandlance constitute 6% of RV catch while the text states they constitute 30%.
- Sandlance – The report should include information regarding habitat usage of Sandlance, i.e., burrowing in substrate part of day; migrating vertically to feed; and no distance migrations as are closely associated with their habitat.
- Sandlance – It should be noted that inshore and offshore sandlance are two different species. The report should highlight which species is impacted by any proposed work.

- Atlantic Cod – Other than a line in one of the tables in this section of the report, there is no mention of Atlantic cod, despite the existence of a published Atlantic cod Recovery Potential Assessment in 2011 (DFO-CSAS).

Section 4.2.1.8 – Environmental Influence and Changes

- This section does provide useful information on climate change on fish and invertebrates; however, the context needs to be improved with the addition of information of the role of the North Atlantic Oscillation (NAO) and more comprehensive text on climate change generally (either in the existing text or earlier in sections on the physical environmental setting).

Section 4.2.1.9 – Aquatic Invasive Species

- Table 4.67 – Green crab is also one of the few AIS which are known to destroy fish habitat (i.e., eelgrass), thereby affecting recruitment of some species (e.g., Morris et al 2010).

Section 4.2.1.10 – Ecologically and Biologically Significant Species (EBSAs)

- The recent identification and description of additional EBSAs in the NL Shelves area (DFO 2013) has not been incorporated into this report. The data layers for these EBSAs can be provided upon request. Notably, The Orphan Spur EBSA, and possibly the edge of the Notre Dame Channel EBSA, overlap with the study area.
- Ecologically and Biologically Significant Areas (EBSAs) – *Southeast Shoal and Tail of the Banks*: It should also be noted here that the Southeast Shoal is an area with some of the highest (if not the highest) benthic biomasses recorded anywhere in the world due to the standing biomass of populations of the Arctic wedge clam, *Mesodesma* sp.
- Figure 4.89 – It is unnecessary for EBSAs outside the Eastern NL SEA boundaries to be included.

Section 4.2.1.11 – Other Ecologically Important Areas

- Figure 4.90 – Ecologically Important Areas Identified in the Orphan Basin SEA (2003). The color designation for the Orphan Basin area should be a darker shade to differentiate from the surrounding area.
- Legends provide a color scheme for abundance/biomass/species richness in Figures 4.91-4.93. It is not indicated how these were derived. No units are shown.

Section 4.2.3 – Marine Mammals and Sea Turtles

Given the objectives of the SEA, the document is generally well written as it pertains to marine mammals.

- The information on Pinnepeds (Section 4.2.3.3) needs to be expanded so that harp seals, hood seals and grey seals are treated separately in the summary table (i.e. in the same manner key whale species were addressed). Although there are similarities in the ecology of harps and hoods, there are enough differences that lumping both species together results in a summary table with content that is too general to be useful. The timing and use of ice habitat for whelping needs to be a focus for each of these two species. There is also a climate change aspect that should be presented and discussed (there is published literature on this topic as well as new information becoming available pers. comm. Garry Stenson). Note that a recent publication on satellite movements of hooded seals indicates that there is significant feeding along the shelf edge to the east of the 'Northeast Shelf Slope' EBSA (Anderson *et al.* 2012).

- Note that there are likely harbour seals present along the southern shore of the Avalon Peninsula for most of the year in addition to the Bays along the south coast. Also, note that this March the Convention on Biological Diversity conducted a science advisory workshop to delineate EBSAs in the Northwest Atlantic Area beyond the 200mile limit. One area that was identified was the shelf break area from the Lilly/Carson Canyon area extending northward to 48° N.

Section 4.3 – Human Activities (4.3.4 Marine Fisheries)

An incomplete (and potentially misleading) description of fishing activities exists in the SEA. Virtually the entire section related to marine fisheries within the current SEA is constructed on the basis of Canadian fisheries, or foreign fisheries which land their catches in Canadian ports. This view of the fishing activities that take place in the SEA study area is limited and incomplete. The entire section related to this topic suggests a distribution of fishing activities that omits entirely the international fisheries operating outside the EEZ managed by NAFO, and therefore most of the maps could mislead an uninformed reader to believe, for example, that there is essentially no fishing going on in the Flemish Cap, or that the Sackville Spur has no fishing whatsoever, when in reality this is one of the areas in the region that has the highest levels of fishing effort (e.g. NAFO 2012a).

Explicitly, it is not implied that these omissions and shortcomings are intentional, but it is highlighted that they effectively render the entire analysis of marine fisheries useless. The SEA states, *“Although the DFO datasets are known not to be comprehensive, particularly with regard to important inshore fisheries, the information provides a useful regional picture of fishing activity in the area that is considered adequate and appropriate for the purposes of the SEA”*. However, this cannot be assumed true. Offshore, without integrating the information from Canadian and international fisheries it is impossible to assess if the picture provided is adequate and appropriate. As such, the entire section on marine fisheries should be redone to incorporate international fishing effort data. These data, in aggregated format, could be requested from the NAFO Secretariat. Note also that Campbell and Feridzon (2013) provide data for fishing vessel activity in the areas governed by NAFO for 2011 and 2012.

To permit a general visual comparison of fisheries activities in the study area with and without inclusion of NAFO data, see Figure 1; Appendix 1 that compares Figure 4.122 from the SEA report (commercial fishing locations in 2008-2012) and Figure 4.2.2.1.7 from NAFO (2012a) (common fishing effort areas derived from VMS data in 2008-2011). Such information should be combined with the fishing effort information from DFO to provide a complete picture of fishing in the SEA area.

Section 5 – Environmental Interactions, Mitigation and Planning Considerations

In general, with regards to environmental interactions, mitigation and planning considerations, the report presents an overview of some of the possible interrelationships resulting from potential offshore oil and gas activities on the Grand Bank and adjacent areas (e.g., Table 5.1) by listing the major activities related to seismic surveys, exploration, drilling and production activities, and how these activities might potentially impact fish and fish habitat, while considering results from previous studies and other sources of available information. However, some areas remain vague in this regard, as do many of the environmental mitigation measures.

Section 5.1 – Fish and Fish habitat (effects assessment)

- This section is a weak summary of other summaries. It is not comprehensive and will not serve as a useful reference. Our understanding has changed dramatically with the research following the Macondo blowout. This should be reflected in this summary.

- Table 5.1 – Information in the table is not adequate. The table is incomplete and often cites reviews of reviews. It is noted in the header that the table is a “Summary of Some Known and Potential Environmental Effects Based on Available Information Sources”. This implies that a thorough job of reviewing and summarizing the existing literature for this aspect of the report was not undertaken.
- Table 5.1 – It should be noted that accidental spills of oils or other substances onto the Southeast Shoal during the period capelin are spawning, eggs are incubating, and yolk sac larvae are in the sediment could have a negative impact on that year class and subsequent spawning biomass.
- The bullet, “Changes in the presence, abundance, distribution and/or health of fish and invertebrates...” is vague. Direct mortality of marine organisms (at various stages of development) resulting from exposure to oil spills should be stated explicitly instead.
- Produced water effects should include increased nutrient loading and the ecosystem consequences for benthic pelagic coupling and production (Rivkin *et al.* 2000).
- Tannen *et al.* (2nd line) is cited incorrectly. The effects found relate to increased oxygen demand not oxygen enrichment. Produced water effects in this section are related to discharge not flaring. Rye *et al.* (2003) is not in the list of references.
- Mitigations for ballast water introduction of invasive species are included, but not for fouling organisms on hulls, drilling rigs or equipment. Protocols for mitigation of these introduction vectors should also be included in this section.
- It is indicated that the Southeast Shoal is a nursery for yellowtail flounder. However, it should also be acknowledged that the Southeast Shoal is the only spawning site for the Southeast Shoal capelin stock.
- The report suggests as a mitigation procedure ‘*avoiding species at risk where possible during the planning and conduction of oil and gas activities in the offshore*’. However, since the three wolffish species are found throughout the study area, no practical avoidance exists. What should be a practical mitigation measure in the case of wolffish or white sharks?
- There are no considerations in the report regarding accidental oil spills vis-à-vis fish species at risk and their habitat. This study includes the spatial distribution of abundance indices for the three wolffish species; and potential spatial and temporal trajectories of oil spills have been modelled and/or simulated in previous studies (e.g. Net Environmental Benefit Analysis of Dispersant Use for Responding to Oil Spills from Oil and Gas Facilities on the Newfoundland Grand Banks, 2013); both sources of information could be used to assess the impact of oil spills on the wolffish populations components found in the study area and could also be used as a framework for identifying appropriate mitigation measures in the case of oil spills.

Section 5.3 – Marine Mammals and Sea Turtles (Effects Assessment)

This section of the document is generally well written as it pertains to marine mammals given the objectives of the SEA. However, it is noted the sections on Important Areas and Times for each of the key VEC species groups (e.g. Marine Mammals and Sea Turtles - 5.3.3.2) have considerable repetition from earlier sections of text. While some of this is warranted, there should also be an effort to link this information with the appropriate mitigation measures presented in each of the preceding sections of text.

- The risk from ingestion of floating debris (i.e. plastic bags) for turtles should be discussed and garbage management and on shore disposal proposed as mitigations.

Section 5.4 – Sensitive and Special Areas (Effects Assessment)

- The effects of drilling wastes on sensitive and sessile benthic species such as corals and sponges is not well understood. However, since they are filter feeders and known to be sensitive to increased sedimentation, organic matter loading and quality of suspended particulate material it can anticipated that they will be negatively affected. There is also very little information on the potential effects of seismic exploration on these organisms. These aspects should be highlighted as a critical information gap within this consideration of sensitive and special areas.
- The mitigation for cumulative effects is to reduce overlap of projects. This is not realistic. Overall this section is inadequate and does not summarize or address the potential for cumulative effects. It should include interactions between activities as well as thresholds for effects and consider climate, habitat and foodweb change as possible drivers.
- This section implies that only designated VMEs and Coral Areas will be considered in this section. Other coral and sponge populations are only briefly referred to in the ecosystem overview and generally ignored in the assessment of potential effects.

Section 5.6 – Cumulative Environmental Effects

This section is very superficial as presented. It is noted within the report that information on cumulative effects is undeveloped here because upcoming projects and their footprints are unknown. However, there is there is also no attempt to describe how cumulative effects are currently being assessed nor is there acknowledgment and discussion regarding the advancements in cumulative effects research in recent years. These issues need to be addressed.

Specifically regarding the issue of unknown projects and unknown project footprint sizes as an explanation for providing no relevant industry information, it is noted that it is indicated elsewhere in the current SEA and on the C-NLOPB website that up to ten Environmental Assessments for petroleum exploration/production activities are in progress. At the very least, an overview and time line of these activities should be presented here.

Note: DFO conducted a National Science Advisory Process to develop a new framework for large project cumulative effects on marine mammals in March 2014 – contact J. Lawson for details on when this information will become available.

Section 5.7 Information Availability, Requirements and Opportunities

Coral and sponge effects and sensitivity should be identified as a significant information gap.

Section 6 – Summary and Conclusions

Page 444 – Regarding the “**C-NLOPB Note: Recommendations and conclusions regarding the issuance of rights and any requirement on the restriction of offshore oil and gas activities in the SEA Study Area will be finalized for inclusion in the Eastern Newfoundland SEA Report following the conclusion of the regulatory and public comment period.**”, It is not clear what this note means. Does it mean that if DFO/NAFO wants to extend the closure of the coral and sponge VMEs to other human activities that CNLOPB will include this in the SEA?

CONCLUSION

In conclusion, the quality of scientific content presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the document can be considered a reliable source of guidance for policy and management decision-making.

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Approved by

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April 16, 2014

Sources of information

This Science Response Report results from the Science Response Process of April 2014 for the Science Review of the Eastern Newfoundland Strategic Environmental Assessment (SEA).

Additional publications from this meeting will be posted on the (DFO) Science Advisory Schedule as they become available.

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Appendix 1: Figures

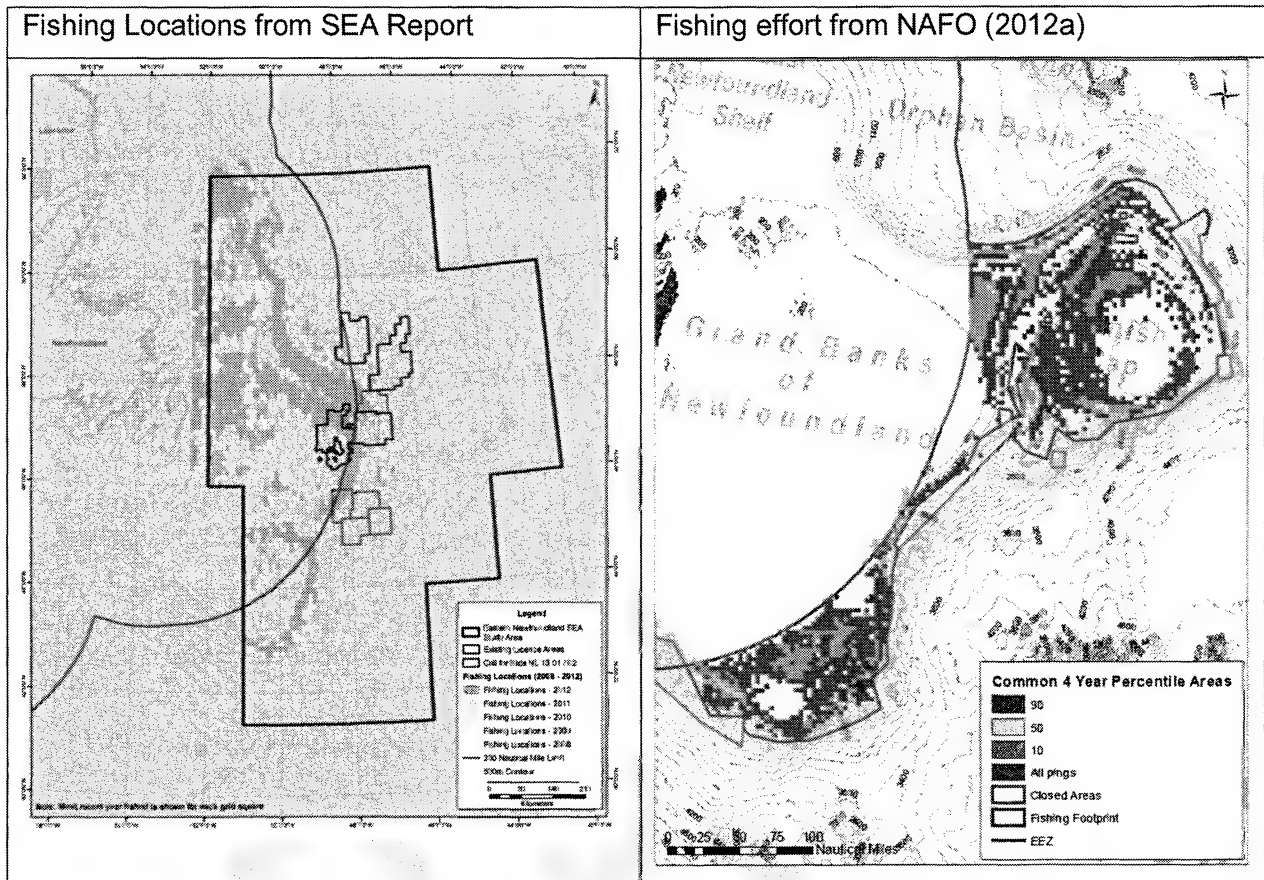


Figure 1. Comparison of Fishing Locations mapping from the Eastern Newfoundland SEA (Sea and NAFO, Figure 4.122 from the SEA report- commercial fishing locations in 2008-2012-) and common fishing effort areas in the NAFO Regulatory Area in 2008-2011 derived from NAFO VMS data (Figure 4.2.2.1.7 from NAFO (2012a)).

This Report is Available from the

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ISSN 1919-3769

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Correct Citation for this Publication:

DFO. 2014. Update of Stock Status Indicators for Northern Shrimp, *Pandalus borealis*, in Shrimp Fishing Areas 4, 5 and 6. DFO Can. Sci. Advis. Sec. Sci. Resp. 2014/nnn.

Aussi disponible en français :

MPO. 2014. Mise à jour des indicateurs de l'état du stock pour la crevette nordique (*Pandalus borealis*) dans les zones de pêche de la crevette 4, 5 et 6. Secr. can. de consult. sci. du MPO, Rép. des Sci. 2014/nnn.

SCIENCE REVIEW OF THE EASTERN NEWFOUNDLAND STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

Context

Since 2002, the C-NLOPB has been conducting Strategic Environmental Assessments (SEAs) of portions of the Newfoundland and Labrador Offshore Area that may have the potential for offshore oil and gas exploration activity. SEA is a broad-based approach to environmental assessment that examines the environmental effects which may be associated with a plan, program or policy proposal and that allows for the incorporation of environmental considerations at the earliest stages of program planning. SEA typically involves a broader-scale environmental assessment (EA) that considers the larger ecological setting, rather than a project-specific environmental assessment that focuses on site-specific issues with defined boundaries. Notably, the accuracy of information in a SEA is especially important as it sets the basis for future project-specific EA within its study area.

On March 5, 2014, The Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) released the [Draft Eastern Newfoundland Strategic Environmental Assessment \(SEA\) Report](#) for public comment.

The Environmental Assessment and Major Projects (EAMP) Division of the DFO Ecosystems Management Branch in the Newfoundland and Labrador Region requested that DFO Science undertake a review of this document, and specifically the information put forward in the SEA on the (physical and biological) Environmental Setting: Section 4.1.4 (Oceanography); Section 4.1.5 (Ice conditions); Section 4.2.1 (Fish and Fish Habitat); Section 4.2.3 (Marine Mammals and Sea Turtles); Section 4.2.4 (Sensitive and Special Areas); as well as that on Environmental Interactions, Mitigation and Planning Considerations (i.e., the effects assessment): Section 5.1 (Fish and Fish Habitat); Section 5.3 (Marine Mammals and Sea Turtles); and Section 5.4 (Sensitive and Special Areas).

Given the short timeline to carry out a review, a DFO Science Response process was undertaken. Science expertise within Fisheries and Oceans, Newfoundland and Labrador Region was solicited to address this review – although the provision of feedback was limited to the areas of the report where expertise was available at the time of the review, including that from Ecological Sciences, Marine Mammals, Marine Fish Species at Risk and Pelagic Sections.

The review found that overall the quality of scientific information presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the final document can be considered a reliable source of guidance for policy and management decision-making.

This Science Response Report results from the April 2014 Science Response Process of for the DFO Science review of the *"Eastern Newfoundland Strategic Environmental Assessment (SEA) (AMEC November 2013)." The report is a summarization of the comments provided by DFO Science Branch, Newfoundland and Labrador Region, to the Marine Habitat Protection Section on the above noted sections, as well as other parts of the document with appropriate linkages to those.*

Analysis and Response

General Comments

- As the *Eastern Newfoundland Strategic Environmental Assessment* is intended to identify and incorporate environmental considerations at the earliest stages of planning and decision making, it is expected to be broad in its scope, and relatively general in its description of potential impacts associated with oil and gas exploration and/or production in the region within the next decade. However, specific details still remain important in many regards as it is fundamental that the SEA provides a complete and comprehensive system-wide perspective in order to be useful for future project-specific EAs.
- Much of the information describing the existing environment is reasonably complete for the area of the SEA that falls inside the 200 mile limit. However, specific information for the offshore (>200 miles) portion of the study area, and in particular the Flemish Cap and Orphan Basin, is lacking. This is largely attributable to lack of consideration of fishing and research data from NAFO sources and is considered a major weakness in the accuracy of the assessment.
- The SEA is lacking a comprehensive overview on climate change in its description of the physical environment. Only a few statements regarding climate change exist throughout, with nothing substantive reported. Information taken from existing models and the most current projections should be presented for key physical indices where available.
- The SEA does not adequately capture the complexity of the biological environment of the study area. The report does not describe functional ecosystem units or attempt to analyze impacts on their structure and function; but rather simply provides a list of components and compiles potential effects on them, as opposed to on the system as a whole. While this type of description is useful, it is not complete, and carries the risk of promoting "tunnel vision" approaches to management issues.
- The SEA is lacking in its consideration of important aspects of the ecosystem such as trophic structure, ecoregion configuration, linkages between the Grand Bank and the northern Newfoundland shelf, and bottom up regulation of ecosystem productivity – all of which are key to understanding the existing environment and potential interactions.
- The SEA provides incomplete descriptions of Vulnerable Marine Ecosystems (VMEs), and is lacking adequate information for characterization of VME indicator species, including their distribution and the potential impacts of oil and gas exploration/production and spills on these.
- The SEA consideration of potential environmental effects is basic at best, failing to synthesize the current understanding of potential effects. This is also the case for the sections on interactions with other human activities including fishing and sensitive and special areas. The potential for cumulative effects is mentioned in the report, but is not developed.
- The SEA contains data sets that appear to be dated (e.g., DFO fish survey data up to 2009; Sea Ice Atlas to 2010; some tropical storm data to 2000; MSC50 wave/current data to 2011; etc.) While it is understandable that some data sets may not be available after a certain date; it is, however, likely that some are available in an updated format (e.g., the most recent tropical storm data). As such, if a data set is 'prematurely' truncated or not being used for some reason – it should be stated as clarification within the report and clarification provided.

Also, if there are additional data expected, it should be noted when they are likely to become available.

Specific Comments

Section 3.2 – Generic Description of Offshore Oil and Gas Activities

- Primary emissions from offshore production should explicitly list produced water since it is the largest waste stream from that activity.
- Spill data for NL offshore should be updated to include 2013. Spill discussion should also include that spills may be due to aging or leaky infrastructure.
- Oils spills scenarios under ice should be included in tables where available. Although they are mentioned as part of some of the studies, inclusion in the tables would prove useful.
- Table 3.4 – Numbers are not standardized per unit time or capacity; therefore, they are misleading. What are the “lifespans” of the wells in this table – i.e., how many of the 29,527 wells in the 1980’s were also operational in the 1970’s (and hence double counted)? The total number operating during each period may reduce the apparent blowout frequency by referencing existence in more than one of the time periods. The number of operating wells in 1971-80 plus the number of “new wells” minus the number of “decommissioned wells” would be a more meaningful number in this column in this comparison. The number of exploration vs. production wells would be very revealing also. It is suggested that revising the blowout instances per unit time of well operational life would be more informative than the numbers currently reported.
- Table 3.8 – Comments in the text related to the table suggests that 2% is some form of benchmark for oil spill dispersion rate. It is not clear what is the basis for reliance on such a number, what the reference authority for this number is, and whether it is an ecologically useful number.

Section 4.1 – Physical Environment

It is notable that the description of the physical environment lacks a comprehensive overview on climate change. While there are a few statements regarding climate change, nothing substantive is reported. This needs to be included in the SEA. In this, the document should include general information on the most current projections relative to air and sea temperatures, currents, primary productivity and changes in frequency of extreme weather based on regional climate change models. This would include consideration of which models are considered best right now for the study area in question; and data gaps and key uncertainties. These projections should be also be integrated into subsequent areas of text throughout the SEA as required (e.g. the sections on ice and ice bergs as well as in the species accounts where information is available).

Section 4.1.1 – Geology

- Note that multiple references for Piper (pers. comm.) exist in this section. Since this is an area of active research, and since the SEA is a living document, this section should be updated on a priority basis as the research is published.
- The explicit risk of a landslide (1/500) is included in the SEA, yet the risks for other geohazards are not specified. This is also reported as a personal communication which may not be particularly useful for future planning. This section should be updated to include the anticipated report from Natural Resources Canada that contains slope failure risk maps. This would provide operators with useful information at the planning stages.

- A map of the features of the Orphan Basin described in this section should be included. They are not in Figure 4.3.

Section 4.1.2 – Bathymetry

- As knowledge of bathymetry is important to understanding many key aspects of the physical and biological environment, it would be helpful to include major bathymetric contours/features in a clear manner on all maps depicted within the report (e.g., Figure 1.1), similar to that in Figure 2.2. Otherwise, maps provide very little frame of reference.
- Figure 4.6 – The figure should indicate in title or legend that bathymetry is in 'm'.

Section 4.1.3 – Climatology

- Precipitation figures need a better explanation for the y-axis indicating whether the frequency of occurrence (%) refers to event duration per month or number of events per month or per day.
- The data for frequency of thunderstorms looks odd. Figure 4.26 shows a big spike in July while Figure 4.28 has a big dip in September. Could these be the result of calculation errors? Since this is a 63-year climatology it should not be related to sample size and interannual variability.

Section 4.1.4 – Oceanography

- The description on extreme wind and wave events partially captures the level of integration and comprehensiveness that is required to make all the information presented useful. However, it is problematic in that it lacks a climate change context.

Section 4.2 – Biological Environment (4.2.1 Fish and Fish Habitat)

A poor description of the ecosystem structure in the study area exists in the SEA. The SEA study area actually expands over at least four different functional ecosystem production units: a) the Grand Bank, b) the Newfoundland-Labrador Shelf, both of them part of the Newfoundland-Labrador Shelves marine ecosystem, c) the Flemish Cap, which is considered a relatively closed marine ecosystem, and d) the oceanic waters beyond the continental shelf break. Furthermore, it includes the transition areas between these ecosystems, and given the large range in depths involved in SEA study area, it can also be argued that it expands over bathypelagic and abyssal oceanic ecosystems. These very basic descriptions, and their potential implications, are currently absent, and need to be incorporated in the SEA.

It should be noted that the basic ecoregion structure in the Grand Bank indicates that the Grand Bank and the Labrador-Newfoundland Shelf can be considered ecosystem sub-units, where the northern Grand Bank (NAFO Division 3L) acts as a transition zone between these subunits. It is also clear the existence of a distinct shelf-break ecoregion, which acts as a transition zone (ecotone) between shelf and oceanic realms (Pepin *et al.* 2010, NAFO 2010b, 2012a). The Flemish Cap also emerges as a distinct ecosystem production unit (Perez-Rodriguez *et al.* 2010, NAFO 2010b), and both the Grand Bank and Flemish Cap are being considered candidate ecosystem management units for the development of ecosystem approaches to fisheries by NAFO (NAFO 2010b).

Although the Newfoundland-Labrador Shelves and Flemish Cap have experienced collapses of major groundfish components, and share many of their core species, the structure of these ecosystems is not identical. For example, the key forage species in the [southern] Grand Bank are sandlance and capelin, shrimp and capelin in the [northern] Newfoundland-Labrador Shelf, while in the Flemish Cap redfish and shrimp have been key prey species for that ecosystem (NAFO 2010b, 2011, 2012, Perez-Rodriguez *et al.* 2011, 2012). Furthermore, in the NL shelves,

there is evidence of bottom-up regulation of capelin, its overall core forage fish species, with linkages between environmental drivers (e.g. ice dynamics), phytoplankton blooms, zooplankton abundance, and capelin dynamics (DFO 2012, Buren *et al.* 2014), and where the dynamics of upper trophic levels (e.g. Atlantic cod) seem to have been driven by availability of food (capelin) and fishing (DFO 2012, Buren *et al.*, submitted). The influence of ice dynamics on ecosystem trends is not observed in the Flemish Cap (NAFO 2011), where besides the impact of fishing, environmental drivers seem to be influencing recruitment success, while predation by top predators appears to regulate the dynamics of juvenile and smaller fishes (Perez-Rodriguez *et al.* 2013), and where strong trophic interactions are linking the core species (cod, redfish and shrimp) in the Flemish Cap ecosystem (NAFO 2011, 2012a).

The above highlights that while the basic ecosystem organization and dynamics that exists in the SEA study area is not described by the SEA document, there are analyses and information available to produce the strategic/broad base description that could provide managers/decision makers with a more functional and holistic perspective of the ecosystems that are potentially affected by oil and gas development.

Section 4.2.1 – Fish and Fish Habitat

- The report provides a comprehensive review of the biology, ecology, distribution and general aspects of the life history of several relevant fish species inhabiting the Grand Bank and southern Labrador shelf. In general the data shown in the Figures and Tables are accurate and informative, and the references cited in the report are generally up to date, with a few exceptions. An interesting aspect of this report is the integrated approach used to describe fish habitat and how it varied temporally and spatially, including the interrelationships of the various trophic/ecological components.
- The SEA contains only partial survey information and exhibits a lack of understanding of the limitations of the DFO trawl surveys. It is notable that the SEA only considers research survey information from DFO, but survey programs conducted by the European Union (EU), and/or some of its member states, exist. These research surveys, focused on the Flemish Cap, but also on the nose and tail of the Grand Bank, are routinely used by NAFO Scientific Council to assess fish stocks in the area, as well as ecosystem structure and interactions. Numerous NAFO documents and papers describe and analyze data from these surveys (e.g. NAFO 2010a, 2010b, 2011, 2012a, Perez-Rodriguez *et al.* 2011, 2012, Nogueira *et al.* 2013).
- While the SEA mentions the changes in areal coverage and gear in the DFO surveys referenced (page 161), it also indicates that 4 invertebrate species had passed its screening process – failing to recognize that only shrimp and crab have been consistently recorded in DFO surveys since the switch to the Campelen gear in 1995-1996. As such, it is actually impossible to establish if other invertebrates (e.g. brittle stars and/or sea urchins, among others) could have met or not the SEA screening criteria. It should be noted, however, that consistency in the recording of invertebrates in DFO surveys has been improved in recent years, and as part of the DFO Ecosystem Research Initiative (ERI) NEREUS Program during 2007-2010, a grab sampling program was implemented in soft bottoms of the Grand Bank (e.g. DFO 2012, Gilkinson 2012). These results should be included in the SEA.
- An incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species exists in the SEA. Over the last 5-7 years, there has been increased research effort devoted to the identification, characterization, and mapping of Vulnerable Marine Ecosystem (VME) indicator species within the SEA study area. Most of this work has been done under the umbrella of NAFO, and through the NAFO Scientific Council (SC) Working Group on Ecosystem Approaches to Fisheries Management (WGAEFM; recently

been renamed SC Working Group on Ecosystem Science and Assessment (WGESA)). Most of this work is not included or mentioned in the current SEA. Furthermore, some recent and relevant studies like Baillon *et al* (2012) and Beazley *et al* (2013) are referenced in the text, but absent in the references section, and some of their implications not included in the document. For example, Baillon's study documents the linkage between seapens (corals) and redfish larvae, and makes the case for seapen fields to be considered essential fish habitat for redfish. This potentially critical role of seapen fields for redfish is absent from Table 4.62 (overview of key groundfish species in the SEA area), and there is no mention of this linkage in Table 5.1. (fish and fish habitat potential environmental interactions).

- It should be noted that sponge grounds are among the more abundant VME indicator species in the SEA study area, but little attention is paid in Table 5.1. to the impacts of potential spills on these large grounds of filter-feeding, habitat forming species; and the spill simulations described in SEA seem to focus on either shoreline/surface impacts or highlights that spills will drift east (beyond 50°W). No attempt to assess the impact of these trajectories on VMEs exists in the current SEA, even though potentially damaging biogenic essential fish habitat could have serious long term impacts on ecosystem productivity.
- Although corals and sponges have been the initial focus in the study of VMEs, many other taxa have been identified as VME indicator species, including tube-dwelling anemones, erect bryozoans, and crinoids, and several physiographic features (e.g. seamounts, canyons, the Southeast shoal) have been identified as VME elements because they contain (or are likely to contain) VMEs (NAFO 2012). These other VME components are not discussed in any detail in the SEA, nor is an assessment of the potential impact of oil and gas exploration/production on them considered.
- Many of the NAFO reports from the Scientific Council meetings since 2008, and the reports from the SC WGSAFM (and references within) summarize most of the available information on VMEs in the SEA study area. These reports should be used not just to describe what is known on VMEs, but also to inform/construct scenarios for spill simulation studies.
- Although not yet available, the upcoming NAFO SC WGESA report (to be released in May 2014) will also contain an updated summary on VMEs, and an analysis of adequacy for current NAFO VME closures. This report will also contain recent findings that suggest that VME areas may be linked to higher fish densities, highlighting the potential importance of these areas for overall ecosystem production. Although it would have been impossible for the SEA drafting team to know these latest unpublished results when putting the SEA document together, the participation of NAFO within the Working Group could have made them aware of this ongoing work, and possibly made available some of the preliminary results for the SEA drafting team.
- Another important source of information that would be useful for preparation of the final version of the SEA is the report of a Convention on Biological Diversity (CBD) Regional Workshop that took place in Montreal, on 24-28 March 2014 and was intended to facilitate the description of ecologically or biologically significant marine areas in the Northwest Atlantic. The international waters within the SEA study area were part of the area considered by this CBD workshop.

Section 4.2.1.3 – Plankton

- Plankton – The role of plankton in nitrogen and carbon cycling is not well explained. The term “biological pump” is misused. It does not refer to benthic pelagic coupling (which is an important process and should be explained) but rather to the sequestration of biogenic carbon in the deep ocean.

- The causal mechanisms of the spring bloom are incomplete. Onset of stratification and the interaction with light availability are key factors. Incorrect use of the term “biological pump” occurs in this section.

Section 4.2.1.4 – Plants and Microalgae

- Several important aspects of macroalgal communities are missing from the SEA. Several types of macroalgae, in particular coralline algae, have depth distributions well in excess of 30 m. Urchin-kelp-coralline algae dynamics are an important determinant of hard substrate communities in our waters (Himmelman and Steele, 1971). The substrate of the Grand Banks has been greatly disturbed by trawling which may affect the distribution of macroalgae. Fishing exclusion zones and artificial reefs may change this and provide refuges for macroalgae. Seaweed zonation with light is an important determinant of distribution. Seaweed communities are vulnerable to oil spills. Therefore coastal seaweed communities and their structure and function should be included in this section.

Section 4.2.1.5 – Benthic Communities

- All Gilkinson and Edinger (2009) citations should be Gilkinson and Edinger (eds.) (2009).
- As different types of benthic communities are sensitive to different types of disturbance, this should be discussed and summarized in a table for easy reference and decision-making.
- Regarding the statement, “...and DFO and NAFO RV surveys...“...visual assessments also poorly...” What is meant by ‘visual assessments’ here?
- Regarding the statement, “It is also important to note that characterizations of benthic communities are also inevitably biased according to sampling method. For example, visual assessments often poorly assess infaunal communities whereas grabs may have challenges sampling communities over harder substrates.” It should also be noted that bottom trawls typically sample only a small fraction of resident benthos, most often larger epibenthos.
- The statement, “Collectively, these studies confirm that benthic communities in the SEA Study Area are quite diverse compared to higher trophic levels, as well as being somewhat sensitive to anthropogenic effects...”, requires qualification. When speaking in terms of sand-dominated continental shelves, the global literature on fishing impacts in these habitats indicate that, in many cases, recovery can be relatively rapid (e.g. months). However, in deep-water slope environments inhabited by slow growing, long-lived corals and sponges, recovery could be measured in terms of decades in many cases, if not longer (Gilkinson and Edinger (eds.)(2009)).
- Further to the statement, “Perhaps the most holistic sampling was done on the Grand Banks as part of a series of trawling impact studies (Prena *et al* 1999; Kenchington *et al* 2001), it should be noted that these researchers used video and grabs (Kenchington *et al* 2001) and a benthic sled and trawl bycatch (Prena *et al* 1999)...”
- Table 4.58 – Some non-shellfish species (e.g., sea urchins, polychaetes, sponges etc.) are included in this table summarizing shellfish species.
- Table 4.58 – Regarding the statement, “*Spat settle primarily between August and November at depths of 10-15 m.*”, it should be noted that they also settle in deep offshore water, primarily gravel, on Grand Bank (Gilkinson and Gagnon, 1991).
- Table 4.58 – Information on ‘Pale Sea urchin’ should reference Gagnon and Gilkinson (1994).

- Table 4.58 – Information on ‘surf clam’ is incorrect. Surfclams (*Spisula solidissima*) are mostly confined to warmer waters, which on Grand Bank, is the Tail of the Bank and Southeast Shoal. The species that is harvested commercially north-east of this area is the Arctic surfclam, *Mactromeris polynyma*, with only sporadic occurrences of *S. solidissima*. Contact Elaine Hynick, Science Branch, DFO for more detailed information.
- Table 4.58 – Information on Polychaete worms, states that they occur on a variety of substrates. However, much of Grand Bank is comprised of sandy sediments which support abundant and diverse populations (documented by Kenchington *et al.*, 2001).
- The statement, “Studies to date indicate that, like fish, benthic assemblages respond to environmental variables such as depth, substrate and flow field (Houston and Haedrich 1984; Schneider *et al* 1987).”, requires addition of the following references related to Grand Banks benthos: Gilkinson and Gagnon, 1991; Gilkinson, 2013; Gale *et al.* (in press).
- Amphipod prey includes much more than just seaweed and phytoplankton. They have many diverse and ecologically important feeding modes. Many are scavengers and some are aggressive predators.
- Polychaete information is not comprehensive. The available literature should be used to provide data on diet and ecological roles of these important members of the benthos.
- The statement, “Collectively, sea pens, soft corals, stony corals, and sponges are represented across the shelf, slopes and banks of the Study Area but are found at their highest densities along the slopes, i.e. depths > 200 m.”, requires addition of references Wareham and Edinger (2007); Wareham (2010).
- The statement, “Sponges, in contrast are more widely distributed and high densities can be found along the eastern slopes of the Grand Banks, around the Flemish Cap and along the northern slopes of the SEA Area”, requires a reference.
- Regarding the statement, “In response to the known sensitivity of coral and sponge grounds, many a number of important coral and sponge areas have been designated as Vulnerable Marine Ecosystems (VMEs) (DFO 2012b) and are protected from damaging fishing activities in Canadian and NAFO waters.”, it should be noted that with the exception of a portion of the SW Grand Banks slope closure, these fishing closures occur in the NAFO regulatory area outside Canadian waters.
- Table 4.61 – The final column of this table is difficult to read. The number of digits after the decimal is inconsistent and the information is center justified, both of which are inappropriate formats for displaying such data. A right justified and constant number of digits after the decimal (suggested one digit past the decimal to be sufficient for “summary” statistics where precision is unwarranted).
- Figures 4.70 and 4.71 – The time period covered by the coral and sponge RV records should be stated in the figure titles.

Section 4.2.1.6 – Marine Fish

- Table 4.62 and 4.63 – Tables are listed alphabetically by species. The order of the species should be taxonomic to permit grouping of species into various logical ecological groups.
- Table 4.62 – There is a notable lack of the most recent publications describing feeding habits and distribution and abundance trends of the three wolffish species found in the study area. The following references should be included in the descriptions for Atlantic Wolffish, Northern Wolffish, and Spotted Wolffish: Simpson *et al.* (2013); Collins *et al.* (2014).

- Table 4.62 – Atlantic Wolffish Habitat and Distribution – Wolffish are found over a variety of substrates (not just “hard clay bottom”), and at depths less than 25 m, and in excess of 250 m.
- Table 4.62 – That Atlantic Wolffish can be retained under SARA, unlike the other two wolffish species, deserves mention, even if this species is not “commercially significant”.
- Table 4.62 – Include fish species as an important component of Cusk diet (Bowman *et al.* 2000). Also include that Cusk is monotypic species in the Northwest Atlantic.
- Table 4.62 – The statement, “A number of research initiatives have also characterized benthic communities on the Grand Banks (Schneider *et al.* 1987; Kenchington *et al.* 2001)”, should include the following references Gilkinson, 2013; Gale *et al.* (in press). Gilkinson (2013) documents benthic communities over areas of Grand Bank as part of the DFO NL NEREUS Ecosystem Research Initiative, which involved a 3-year grab sampling program during multispecies trawl surveys. Gale *et al.* (in press) describe seastar (Asteroidea) assemblages and habitat use over wide areas of the eastern Canadian continental shelf and slope based on DFO survey trawl bycatch records and ROV video.
- Northern Wolffish – The statement “...occurs in Arctic seas on both sides of the North Atlantic Ocean” should be rewritten. Northern Wolffish occurs in both Arctic and Atlantic Oceans – as do other wolffish species, though no mention of this is made. The fact that Northern Wolffish is more pelagic than the other two species should also be noted.
- The statement that Northern Wolffish is distributed as a ‘widespread self-assemblage’, is incorrect. Northern Wolffish are mostly found along the shelf edge, not on the shelf.
- It should be included that, in the past, redfish larvae dominated the ichthyoplankton in many parts of the SEA area (Serebryakov *et al.* 1987).
- The introduction of invasive species and changes to habitat and/or community structure should also be discussed in the context of cumulative effects.
- The statement, “A total of four invertebrate taxa (snow crab, northern shrimp, pink striped shrimp, and shrimp *Pandalus propinquus*) were available from the Canadian Research Vessel surveys (Table 4.60)”, requires clarification. These are the major commercial spp., however many other non-commercial taxa have been processed using standardized protocols during RV surveys since 2005/2006. The point of availability is inaccurate.
- Roughhead Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic, only. A publication by Edinger *et al.* (2007) contains information on Roughhead Grenadier in NL waters. Specifically, it reports that Roughhead Grenadier were found in association with deep-sea corals, such as gorgonians, antipatharians, and soft corals, at depths of 200-1000 m.
- Roundnose Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic only. In the Northwest Atlantic, the species has been caught at depths less than 400 m. The data provided for NL comes from Parsons 1976. Newer information is available, in Power and Maddock Parsons (1998) and Kulka (2001). Most catches of this species occurred at depths of 900 m or more.
- Spotted Wolffish – Spawning in late autumn and early winter was suggested by Templeman 1966. A more recent publication (Templeman 1986) suggested mid to late summer spawning (July-August-Sept).
- White Hake – White Hake occur at depths much less than 200 m. On the western St. Pierre Bank, and southwest slope of the Grand Bank, they frequently occur at around 100 m (Han

and Kulka 2007). Juvenile White Hake are commonly found inshore, and may even occupy estuaries. Reference to Longfin Hake (*U. chesteri*) is not appropriate.

- White Hake – Not all juvenile White Hake are pelagic. The juvenile stage of the life cycle is characterized by pelagic and (later) demersal components.
- Winter Skate – Kelly and Hanson (2013) estimated that 40-70 egg cases are deposited each year. Also, cephalopods (squid) are an important component of the diet.
- Herring – The occurrence for this species has been recorded up to 450 m in multispecies surveys.
- Capelin – Capelin are found in 3NLOPs in spring RV survey. Include 3K and 2J from fall RV survey. Besides the RV trawl surveys, capelin distribution information is available from annual DFO acoustic surveys.
- The information related to 'subsequently spent adults...' is incorrect and wrongly cited. Spent females move out to deeper water after spawning on beaches/bottom sites. Those that survive eventually migrate to offshore feeding areas and likely aggregate with capelin that will be maturing and spawning next year. The timing, the route, and the mechanisms used to migrate from coastal waters to offshore feeding areas have not been knowingly documented.
- Include cephalopods as a major component of the Shortfin Mako diet.
- Include reproduction of White Sharks via internal fertilization, with development characterized by aplacental viviparity (also known as ovoviviparity) with embryonic oophagy. See Saïdi *et al.* 2005.
- Table 4.54 – Capelin spawning on Southeast Shoal takes place in June, July. Capelin also spawn on the bottom in coastal waters.
- Table 4.54 – Capelin spawning time (cumulatively) on beaches and coastal bottom sites and the Southeast Shoal encompasses May, June, July, August.
- Table 4.54 – No corresponding footnote reference exists for superscript #4.
- Table 4.54 – Sandlance spawning season is winter (December-March) not June–August as indicated in the table.
- Table 4.65 – There is much accompanying text around this table related to the inflated representation introduced by comparing numbers among various body sizes (e.g., cod versus sand lance). Agreed this is important – suggested to add a Table be added as a companion table which reports not numbers, but rather weight of catch by species reflecting the biomass of the various species in the SEA area.
- Sandlance – Table 4.65 states Sandlance constitute 6% of RV catch while the text states they constitute 30%.
- Sandlance – The report should include information regarding habitat usage of Sandlance, i.e., burrowing in substrate part of day; migrating vertically to feed; and no distance migrations as are closely associated with their habitat.
- Sandlance – It should be noted that inshore and offshore sandlance are two different species. The report should highlight which species is impacted by any proposed work.

- Atlantic Cod – Other than a line in one of the tables in this section of the report, there is no mention of Atlantic cod, despite the existence of a published Atlantic cod Recovery Potential Assessment in 2011 (DFO-CSAS).

Section 4.2.1.8 – Environmental Influence and Changes

- This section does provide useful information on climate change on fish and invertebrates; however, the context needs to be improved with the addition of information of the role of the North Atlantic Oscillation (NAO) and more comprehensive text on climate change generally (either in the existing text or earlier in sections on the physical environmental setting).

Section 4.2.1.9 – Aquatic Invasive Species

- Table 4.67 – Green crab is also one of the few AIS which are known to destroy fish habitat (i.e., eelgrass), thereby affecting recruitment of some species (e.g., Morris et al 2010).

Section 4.2.1.10 – Ecologically and Biologically Significant Species (EBSAs)

- The recent identification and description of additional EBSAs in the NL Shelves area (DFO 2013) has not been incorporated into this report. The data layers for these EBSAs can be provided upon request. Notably, The Orphan Spur EBSA, and possibly the edge of the Notre Dame Channel EBSA, overlap with the study area.
- Ecologically and Biologically Significant Areas (EBSAs) – *Southeast Shoal and Tail of the Banks*: It should also be noted here that the Southeast Shoal is an area with some of the highest (if not the highest) benthic biomasses recorded anywhere in the world due to the standing biomass of populations of the Arctic wedge clam, *Mesodesma sp.*
- Figure 4.89 – It is unnecessary for EBSAs outside the Eastern NL SEA boundaries to be included.

Section 4.2.1.11 – Other Ecologically Important Areas

- Figure 4.90 – Ecologically Important Areas Identified in the Orphan Basin SEA (2003). The color designation for the Orphan Basin area should be a darker shade to differentiate from the surrounding area.
- Legends provide a color scheme for abundance/biomass/species richness in Figures 4.91-4.93. It is not indicated how these were derived. No units are shown.

Section 4.2.3 – Marine Mammals and Sea Turtles

Given the objectives of the SEA, the document is generally well written as it pertains to marine mammals. However, similar to other sections in the document, this text also lacks synthesis and integration of information from a trophic dynamics and changing marine environment perspective. Where possible this deficiency needs to be addressed (particularly in the case of threatened and endangered species).

- In either the Introductory paragraph on Mysticetes (4.2.3.1) or the in the supporting tables (under Foraging Strategy and Food Sources), additional text is required to emphasize that these species migrate into our waters to feed for a limited amount of time on relatively specific prey species that are densely aggregated with variable distribution and abundance. As the information is presented now, these key ecological factors do not receive the attention required.
- There is no mention in any of the tables or Introductory paragraphs for either Mysticetes or Odontocetes that most of these species have complex social structures and

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communication systems. Although group size is mentioned in the tables, this doesn't adequately highlight these important behavioral traits.

- The information on Pinnepeds (Section 4.2.3.3) needs to be expanded so that harp seals, hood seals and grey seals are treated separately in the summary table (i.e. in the same manner key whale species were addressed). Although there are similarities in the ecology of harps and hoods, there are enough differences that lumping both species together results in a summary table with content that is too general to be useful. The timing and use of ice habitat for whelping needs to be a focus for each of these two species. There is also a climate change aspect that should be presented and discussed (there is published literature on this topic as well as new information becoming available pers. comm. Garry Stenson). Note that a recent publication on satellite movements of hooded seals indicates that there is significant feeding along the shelf edge to the east of the 'Northeast Shelf Slope' EBSA (Anderson *et al.* 2012).
- Note that there are likely harbour seals present along the southern shore of the Avalon Peninsula for most of the year in addition to the Bays along the south coast.
- Also, note that this March the Convention on Biological Diversity conducted a science advisory workshop to delineate EBSAs in the Northwest Atlantic Area, including areas beyond the 200mile limit. The One area that was identified was the shelf break area from the vicinity of Lilly/Carson Canyon area extending northward to approximately 48° N was identified as a potential EBSA and further emphasizes the biological importance of this slope habitat.

Section 4.3 – Human Activities (4.3.4 Marine Fisheries)

An incomplete (and potentially misleading) description of fishing activities exists in the SEA. Virtually the entire section related to marine fisheries within the current SEA is constructed on the basis of Canadian fisheries, or foreign fisheries which land their catches in Canadian ports. This view of the fishing activities that take place in the SEA study area is limited and incomplete. The entire section related to this topic suggests a distribution of fishing activities that omits entirely the international fisheries operating outside the EEZ managed by NAFO, and therefore most of the maps could misled an uninformed reader to believe, for example, that there is essentially no fishing going on in the Flemish Cap, or that the Sackville Spur has no fishing whatsoever, when in reality this is one of the areas in the region that has the highest levels of fishing effort (e.g. NAFO 2012a).

Explicitly, it is not implied that these omissions and shortcomings are intentional, but it is highlighted that they effectively render the entire analysis of marine fisheries useless. The SEA states, "Although the DFO datasets are known not to be comprehensive, particularly with regard to important inshore fisheries, the information provides a useful regional picture of fishing activity in the area that is considered adequate and appropriate for the purposes of the SEA". However, this cannot be assumed true. Offshore, without integrating the information from Canadian and international fisheries it is impossible to assess if the picture provided is adequate and appropriate. As such, the entire section on marine fisheries should be redone to incorporate international fishing effort data. These data, in aggregated format, could be requested from the NAFO Secretariat. Note also that Campbell and Feridizon (2013) provide data for fishing vessel activity in the areas governed by NAFO for 2011 and 2012.

To permit a general visual comparison of fisheries activities in the study area with and without inclusion of NAFO data, see Figure 1; Appendix 1 that compares Figure 4.122 from the SEA report (commercial fishing locations in 2008-2012) and Figure 4.2.2.1.7 from NAFO (2012a)

(common fishing effort areas derived from VMS data in 2008-2011). Such information should be combined with the fishing effort information from DFO to provide a complete picture of fishing in the SEA area.

Section 5 – Environmental Interactions, Mitigation and Planning Considerations

In general, with regards to environmental interactions, mitigation and planning considerations, the report presents an overview of some of the possible interrelationships resulting from potential offshore oil and gas activities on the Grand Bank and adjacent areas (e.g., Table 5.1) by listing the major activities related to seismic surveys, exploration, drilling and production activities, and how these activities might potentially impact fish and fish habitat, while considering results from previous studies and other sources of available information. However, some areas remain vague in this regard, as do many of the environmental mitigation measures.

Section 5.1 – Fish and Fish habitat (effects assessment)

- This section is a weak summary of other summaries. It is not comprehensive and will not serve as a useful reference. Our understanding has changed dramatically with the research following the Macondo blowout. This should be reflected in this summary.
- Table 5.1 – Information in the table is not adequate. The table is incomplete and often cites reviews of reviews. It is noted in the header that the table is a “Summary of Some Known and Potential Environmental Effects Based on Available Information Sources”. This implies that a thorough job of reviewing and summarizing the existing literature for this aspect of the report was not undertaken.
- Table 5.1 – It should be noted that accidental spills of oils or other substances onto the Southeast Shoal during the period capelin are spawning, eggs are incubating, and yolk sac larvae are in the sediment could have a negative impact on that year class and subsequent spawning biomass.
- The bullet, “Changes in the presence, abundance, distribution and/or health of fish and invertebrates...” is vague. Direct mortality of marine organisms (at various stages of development) resulting from exposure to oil spills should be stated explicitly instead.
- Produced water effects should include increased nutrient loading and the ecosystem consequences for benthic pelagic coupling and production (Rivkin *et al.* 2000).
- Tannen *et al.* (2nd line) is cited incorrectly. The effects found relate to increased oxygen demand not oxygen enrichment. Produced water effects in this section are related to discharge not flaring. Rye *et al.* (2003) is not in the list of references.
- Mitigations for ballast water introduction of invasive species are included, but not for fouling organisms on hulls, drilling rigs or equipment. Protocols for mitigation of these introduction vectors should also be included in this section.
- It is indicated that the Southeast Shoal is a nursery for yellowtail flounder. However, it should also be acknowledged that the Southeast Shoal is the only spawning site for the Southeast Shoal capelin stock.
- The report suggests as a mitigation procedure ‘avoiding species at risk where possible during the planning and conduction of oil and gas activities in the offshore’. However, since the three wolffish species are found throughout the study area, no practical avoidance exists. What should be a practical mitigation measure in the case of wolffish or white sharks?

- There are no considerations in the report regarding accidental oil spills vis-à-vis fish species at risk and their habitat. This study includes the spatial distribution of abundance indices for the three wolffish species; and potential spatial and temporal trajectories of oil spills have been modelled and/or simulated in previous studies (e.g. Net Environmental Benefit Analysis of Dispersant Use for Responding to Oil Spills from Oil and Gas Facilities on the Newfoundland Grand Banks, 2013); both sources of information could be used to assess the impact of oil spills on the wolffish populations components found in the study area and could also be used as a framework for identifying appropriate mitigation measures in the case of oil spills.

Section 5.3 – Marine Mammals and Sea Turtles (Effects Assessment)

This section of the document is generally well written as it pertains to marine mammals given the objectives of the SEA. However, it is noted the sections on Important Areas and Times for each of the key VEC species groups (e.g. Marine Mammals and Sea Turtles - 5.3.3.2) have considerable repetition from earlier sections of text. While some of this is warranted, there should also be an effort to link this information with the appropriate mitigation measures presented in each of the preceding sections of text.

- The risk from ingestion of floating debris (i.e. plastic bags) for turtles should be discussed and garbage management and on shore disposal proposed as mitigations.

Section 5.4 – Sensitive and Special Areas (Effects Assessment)

- The effects of drilling wastes on sensitive and sessile benthic species such as corals and sponges is not well understood. However, since they are filter feeders and known to be sensitive to increased sedimentation, organic matter loading and quality of suspended particulate material it can anticipated that they will be negatively affected. There is also very little information on the potential effects of seismic exploration on these organisms. These aspects should be highlighted as a critical information gap within this consideration of sensitive and special areas.
- The mitigation for cumulative effects is to reduce overlap of projects. This is not realistic. Overall this section is inadequate and does not summarize or address the potential for cumulative effects. It should include interactions between activities as well as thresholds for effects and consider climate, habitat and foodweb change as possible drivers.
- This section implies that only designated VMEs and Coral Areas will be considered in this section. Other coral and sponge populations are only briefly referred to in the ecosystem overview and generally ignored in the assessment of potential effects.

Section 5.6 – Cumulative Environmental Effects

This section is very superficial as presented. It is noted within the report that information on cumulative effects is undeveloped here because upcoming projects and their footprints are unknown. However, there is there is also no attempt to describe how cumulative effects are currently being assessed nor is there acknowledgment and discussion regarding the advancements in cumulative effects research in recent years. These issues need to be addressed.

Specifically regarding the issue of unknown projects and unknown project footprint sizes as an explanation for providing no relevant industry information, it is noted that it is indicated elsewhere in the current SEA and on the C-NLOPB website that up to ten Environmental Assessments for petroleum exploration/production activities are in progress. At the very least, an overview and time line of these activities should be presented here.

Note: DFO conducted a National Science Advisory Process to develop a new framework for large project cumulative effects on marine mammals in March 2014 – contact J. Lawson for details on when this information will become available.

Section 5.7 Information Availability, Requirements and Opportunities

Coral and sponge effects and sensitivity should be identified as a significant information gap.

Section 6 – Summary and Conclusions

Page 444 – Regarding the “**C-NLOPB Note: Recommendations and conclusions regarding the issuance of rights and any requirement on the restriction of offshore oil and gas activities in the SEA Study Area will be finalized for inclusion in the Eastern Newfoundland SEA Report following the conclusion of the regulatory and public comment period.**”, It is not clear what this note means. Does it mean that if DFO/NAFO wants to extend the closure of the coral and sponge VMEs to other human activities that CNLOPB will include this in the SEA?

CONCLUSION

In conclusion, the quality of scientific content presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the document can be considered a reliable source of guidance for policy and management decision-making.

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Approved by

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Regional Director of Science
DFO, Newfoundland and Labrador Region

April 16, 2014

Sources of information

This Science Response Report results from the Science Response Process of April 2014 for the Science Review of the Eastern Newfoundland Strategic Environmental Assessment (SEA).

Additional publications from this meeting will be posted on the [\(DFO\) Science Advisory Schedule](#) as they become available.

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DRAFT

Appendix 1: Figures

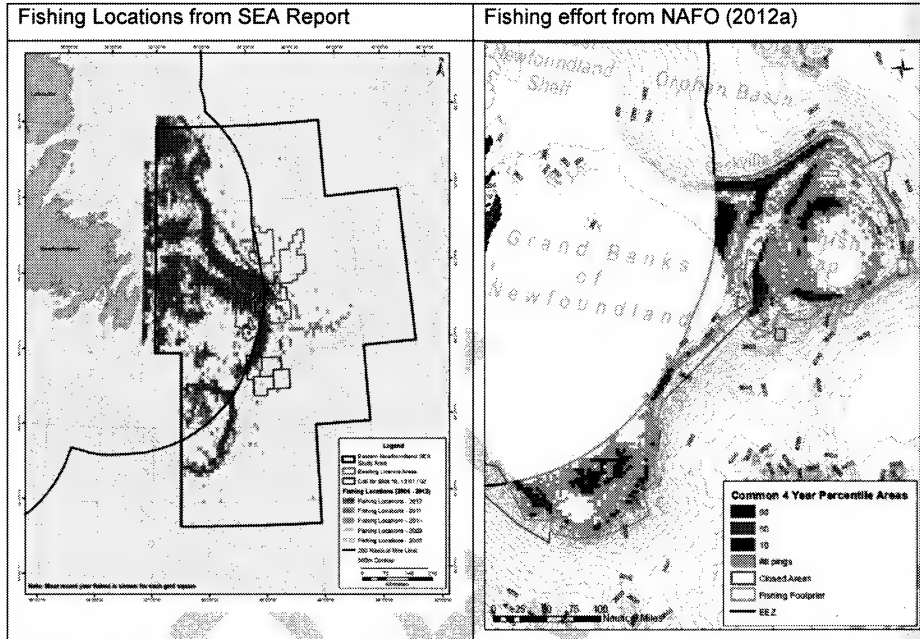


Figure 1. Comparison of Fishing Locations mapping from the Eastern Newfoundland Sea and NAFO.

This Report is Available from the

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ISSN 1919-3769

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Correct Citation for this Publication:

DFO. 2014. Update of Stock Status Indicators for Northern Shrimp, *Pandalus borealis*, in Shrimp Fishing Areas 4, 5 and 6. DFO Can. Sci. Advis. Sec. Sci. Resp. 2014/nnn.

Aussi disponible en français :

MPO. 2014. Mise à jour des indicateurs de l'état du stock pour la crevette nordique (*Pandalus borealis*) dans les zones de pêche de la crevette 4, 5 et 6. Secr. can. de consult. sci. du MPO, Rép. des Sci. 2014/nnn.

SCIENCE REVIEW OF THE EASTERN NEWFOUNDLAND STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA)

Context

Since 2002, the C-NLOPB has been conducting Strategic Environmental Assessments (SEAs) of portions of the Newfoundland and Labrador Offshore Area that may have the potential for offshore oil and gas exploration activity. SEA is a broad-based approach to environmental assessment that examines the environmental effects which may be associated with a plan, program or policy proposal and that allows for the incorporation of environmental considerations at the earliest stages of program planning. SEA typically involves a broader-scale environmental assessment (EA) that considers the larger ecological setting, rather than a project-specific environmental assessment that focuses on site-specific issues with defined boundaries. Notably, the accuracy of information in a SEA is especially important as it sets the basis for future project-specific EA within its study area.

On March 5, 2014, The Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) released the [Draft Eastern Newfoundland Strategic Environmental Assessment \(SEA\) Report](#) for public comment.

The Environmental Assessment and Major Projects (EAMP) Division of the DFO Ecosystems Management Branch in the Newfoundland and Labrador Region requested that DFO Science undertake a review of this document, and specifically the information put forward in the SEA on the (physical and biological) Environmental Setting: Section 4.1.4 (Oceanography); Section 4.1.5 (Ice conditions); Section 4.2.1 (Fish and Fish Habitat); Section 4.2.3 (Marine Mammals and Sea Turtles); Section 4.2.4 (Sensitive and Special Areas); as well as that on Environmental Interactions, Mitigation and Planning Considerations (i.e., the effects assessment): Section 5.1 (Fish and Fish Habitat); Section 5.3 (Marine Mammals and Sea Turtles); and Section 5.4 (Sensitive and Special Areas).

Given the short timeline to carry out a review, a DFO Science Response process was undertaken. Science expertise within Fisheries and Oceans, Newfoundland and Labrador Region was solicited to address this review – although the provision of feedback was limited to the areas of the report where expertise was available at the time of the review, including that from Ecological Sciences, Marine Mammals, Marine Fish Species at Risk and Pelagic Sections.

The review found that overall the quality of scientific information presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the final document can be considered a reliable source of guidance for policy and management decision-making.

This Science Response Report results from the April 2014 Science Response Process of for the DFO Science review of the “*Eastern Newfoundland Strategic Environmental Assessment (SEA) (AMEC November 2013)*.” The report is a summarization of the comments provided by DFO Science Branch, Newfoundland and Labrador Region, to the Marine Habitat Protection Section on the above noted sections, as well as other parts of the document with appropriate linkages to those.

Analysis and Response

General Comments

- As the *Eastern Newfoundland Strategic Environmental Assessment* is intended to identify and incorporate environmental considerations at the earliest stages of planning and decision making, it is expected to be broad in its scope, and relatively general in its description of potential impacts associated with oil and gas exploration and/or production in the region within the next decade. However, specific details still remain important in many regards as it is fundamental that the SEA provides a complete and comprehensive system-wide perspective in order to be useful for future project-specific EAs.
- Much of the information describing the existing environment is reasonably complete for the area of the SEA that falls inside the 200 mile limit. However, specific information for the offshore (>200 miles) portion of the study area, and in particular the Flemish Cap and Orphan Basin, is lacking. This is largely attributable to lack of consideration of fishing and research data from NAFO sources and is considered a major weakness in the accuracy of the assessment.
- The SEA is lacking a comprehensive overview on climate change in its description of the physical environment. Only a few statements regarding climate change exist throughout, with nothing substantive reported. Information taken from existing models and the most current projections should be presented for key physical indices where available.
- The SEA does not adequately capture the complexity of the biological environment of the study area. The report does not describe functional ecosystem units or attempt to analyze impacts on their structure and function; but rather simply provides a list of components and compiles potential effects on them, as opposed to on the system as a whole. While this type of description is useful, it is not complete, and carries the risk of promoting “tunnel vision” approaches to management issues.
- The SEA is lacking in its consideration of important aspects of the ecosystem such as trophic structure, ecoregion configuration, linkages between the Grand Bank and the northern Newfoundland shelf, and bottom up regulation of ecosystem productivity – all of which are key to understanding the existing environment and potential interactions.
- The SEA provides incomplete descriptions of Vulnerable Marine Ecosystems (VMEs), and is lacking adequate information for characterization of VME indicator species, including their distribution and the potential impacts of oil and gas exploration/production and spills on these.
- The SEA consideration of potential environmental effects is basic at best, failing to synthesize the current understanding of potential effects. This is also the case for the sections on interactions with other human activities including fishing and sensitive and special areas. The potential for cumulative effects is mentioned in the report, but is not developed.
- The SEA contains data sets that appear to be dated (e.g., DFO fish survey data up to 2009; Sea Ice Atlas to 2010; some tropical storm data to 2000; MSC50 wave/current data to 2011; etc.) While it is understandable that some data sets may not be available after a certain date; it is, however, likely that some are available in an updated format (e.g., the most recent tropical storm data). As such, if a data set is ‘prematurely’ truncated or not being used for some reason – it should be stated as clarification within the report. Also, if there are additional data expected, it should be noted when they are likely to become available.

Specific Comments

Section 3.2 – Generic Description of Offshore Oil and Gas Activities

- Primary emissions from offshore production should explicitly list produced water since it is the largest waste stream from that activity.
- Spill data for NL offshore should be updated to include 2013. Spill discussion should also include that spills may be due to aging or leaky infrastructure.
- Oils spills scenarios under ice should be included in tables where available. Although they are mentioned as part of some of the studies, inclusion in the tables would prove useful.
- Table 3.4 – Numbers are not standardized per unit time or capacity; therefore, they are misleading. What are the “lifespans” of the wells in this table – i.e., how many of the 29,527 wells in the 1980’s were also operational in the 1970’s (and hence double counted)? The total number operating during each period may reduce the apparent blowout frequency by referencing existence in more than one of the time periods. The number of operating wells in 1971-80 plus the number of “new wells” minus the number of “decommissioned wells” would be a more meaningful number in this column in this comparison. The number of exploration vs. production wells would be very revealing also. It is suggested that revising the blowout instances per unit time of well operational life would be more informative than the numbers currently reported.
- Table 3.8 – Comments in the text related to the table suggests that 2% is some form of benchmark for oil spill dispersion rate. It is not clear what is the basis for reliance on such a number, what the reference authority for this number is, and whether it is an ecologically useful number.

Section 4.1 – Physical Environment

It is notable that the description of the physical environment lacks a comprehensive overview on climate change. While there are a few statements regarding climate change, nothing substantive is reported. This needs to be included in the SEA. In this, the document should include general information on the most current projections relative to air and sea temperatures, currents, primary productivity and changes in frequency of extreme weather based on regional climate change models. This would include consideration of which models are considered best right now for the study area in question; and data gaps and key uncertainties. These projections should also be integrated into subsequent areas of text throughout the SEA as required (e.g. the sections on ice and ice bergs as well as in the species accounts where information is available).

Section 4.1.1 – Geology

- Note that multiple references for Piper (pers. comm.) exist in this section. Since this is an area of active research, and since the SEA is a living document, this section should be updated on a priority basis as the research is published.
- The explicit risk of a landslide (1/500) is included in the SEA, yet the risks for other geohazards are not specified. This is also reported as a personal communication which may not be particularly useful for future planning. This section should be updated to include the anticipated report from Natural Resources Canada that contains slope failure risk maps. This would provide operators with useful information at the planning stages.
- A map of the features of the Orphan Basin described in this section should be included. They are not in Figure 4.3.

Section 4.1.2 – Bathymetry

- As knowledge of bathymetry is important to understanding many key aspects of the physical and biological environment, it would be helpful to include major bathymetric contours/features in a clear manner on all maps depicted within the report (e.g., Figure 1.1), similar to that in Figure 2.2. Otherwise, maps provide very little frame of reference.
- Figure 4.6 – The figure should indicate in title or legend that bathymetry is in 'm'.

Section 4.1.3 – Climatology

- Precipitation figures need a better explanation for the y-axis indicating whether the frequency of occurrence (%) refers to event duration per month or number of events per month or per day.
- The data for frequency of thunderstorms looks odd. Figure 4.26 shows a big spike in July while Figure 4.28 has a big dip in September. Could these be the result of calculation errors? Since this is a 63-year climatology it should not be related to sample size and interannual variability.

Section 4.1.4 – Oceanography

- The description on extreme wind and wave events partially captures the level of integration and comprehensiveness that is required to make all the information presented useful. However, it is problematic in that it lacks a climate change context.

Section 4.2 – Biological Environment (4.2.1 Fish and Fish Habitat)

A poor description of the ecosystem structure in the study area exists in the SEA. The SEA study area actually expands over at least four different functional ecosystem production units: a) the Grand Bank, b) the Newfoundland-Labrador Shelf, both of them part of the Newfoundland-Labrador Shelves marine ecosystem, c) the Flemish Cap, which is considered a relatively closed marine ecosystem, and d) the oceanic waters beyond the continental shelf break. Furthermore, it includes the transition areas between these ecosystems, and given the large range in depths involved in SEA study area, it can also be argued that it expands over bathypelagic and abyssal oceanic ecosystems. These very basic descriptions, and their potential implications, are currently absent, and need to be incorporated in the SEA.

It should be noted that the basic ecoregion structure in the Grand Bank indicates that the Grand Bank and the Labrador-Newfoundland Shelf can be considered ecosystem sub-units, where the northern Grand Bank (NAFO Division 3L) acts as a transition zone between these subunits. It is also clear the existence of a distinct shelf-break ecoregion, which acts as a transition zone (ecotone) between shelf and oceanic realms (Pepin *et al.* 2010, NAFO 2010b, 2012a). The Flemish Cap also emerges as a distinct ecosystem production unit (Perez-Rodriguez *et al.* 2010, NAFO 2010b), and both the Grand Bank and Flemish Cap are being among considered the candidate ecosystem management units being considered for the development of an ecosystem -approaches to fisheries by NAFO (NAFO 2010b).

Although the Newfoundland-Labrador Shelves and Flemish Cap have experienced collapses of major groundfish components, and share many of their core species, the structure of these ecosystems is not identical. For example, the key forage species in the [southern] Grand Bank are sandlance and capelin, shrimp and capelin in the [northern] Newfoundland-Labrador Shelf, while in the Flemish Cap redfish and shrimp have been key prey species for that ecosystem (NAFO 2010b, 2011, 2012, Perez-Rodriguez *et al.* 2011, 2012). Furthermore, in the NL shelves, there is evidence of bottom-up regulation of capelin, its overall core forage fish species, with linkages between environmental drivers (e.g. ice dynamics), phytoplankton blooms, zooplankton

abundance, and capelin dynamics (DFO 2012, Buren *et al.* 2014), and where the dynamics of upper trophic levels (e.g. Atlantic cod) seem to have been driven by availability of food (capelin) and fishing (DFO 2012, Buren *et al.*, submitted). The influence of ice dynamics on ecosystem trends is not observed in the Flemish Cap (NAFO 2011), where besides the impact of fishing, environmental drivers seem to be influencing recruitment success, while predation by top predators appears to regulate the dynamics of juvenile and smaller fishes (Perez-Rodriguez *et al.* 2013), and where strong trophic interactions are linking the core species (cod, redfish and shrimp) in the Flemish Cap ecosystem (NAFO 2011, 2012a).

The above highlights that while the basic ecosystem organization and dynamics that exists in the SEA study area is not described by the SEA document, there are analyses and information available to produce the strategic/broad base description that could provide managers/decision makers with a more functional and holistic perspective of the ecosystems that are potentially affected by oil and gas development.

Section 4.2.1 – Fish and Fish Habitat

- The report provides a comprehensive review of the biology, ecology, distribution and general aspects of the life history of several relevant fish species inhabiting the Grand Bank and southern Labrador shelf. In general the data shown in the Figures and Tables are accurate and informative, and the references cited in the report are generally up to date, with a few exceptions. An interesting aspect of this report is the integrated approach used to describe fish habitat and how it varied temporally and spatially, including the interrelationships of the various trophic/ecological components.
- The SEA contains only partial survey information and exhibits a lack of understanding of the limitations of the DFO trawl surveys. It is notable that the SEA only considers research survey information from DFO, but survey programs conducted by the European Union (EU), and/or some of its member states, exist. These research surveys, focused on the Flemish Cap, but also on the nose and tail of the Grand Bank, are routinely used by NAFO Scientific Council to assess fish stocks in the area, as well as ecosystem structure and interactions. Numerous NAFO documents and papers describe and analyze data from these surveys (e.g. NAFO 2010a, 2010b, 2011, 2012a, Perez-Rodriguez *et al.* 2011, 2012, Nogueira *et al.* 2013).
- While the SEA mentions the changes in areal coverage and gear in the DFO surveys referenced (page 161), it also indicates that 4 invertebrate species had passed its screening process – failing to recognize that only shrimp and crab have been consistently recorded in DFO surveys since the switch to the Campelen gear in 1995-1996. As such, it is actually impossible to establish if other invertebrates (e.g. brittle stars and/or sea urchins, among others) could have met or not the SEA screening criteria. It should be noted, however, that consistency in the recording of invertebrates in DFO surveys has been improved in recent years, and as part of the DFO Ecosystem Research Initiative (ERI) NEREUS Program during 2007-2010, a grab sampling program was implemented in soft bottoms of the Grand Bank (e.g. DFO 2012, Gilkinson 2012). These results should be included in the SEA.
- An incomplete description and characterization of Vulnerable Marine Ecosystem (VME) indicator species exists in the SEA. Over the last 5-7 years, there has been increased research effort devoted to the identification, characterization, and mapping of Vulnerable Marine Ecosystem (VME) indicator species within the SEA study area. Most of this work has been done under the umbrella of NAFO, and through the NAFO Scientific Council (SC) Working Group on Ecosystem Approaches to Fisheries Management (WGEAFM; recently been renamed SC Working Group on Ecosystem Science and Assessment (WGESA)). Most of this work is not included or mentioned in the current SEA. Furthermore, some recent and

relevant studies like Baillon *et al* (2012) and Beazley *et al* (2013) are referenced in the text, but absent in the references section, and some of their implications not included in the document. For example, Baillon's study documents the linkage between seapens (corals) and redfish larvae, and makes the case for seapen fields to be considered essential fish habitat for redfish. This potentially critical role of seapen fields for redfish is absent from Table 4.62 (overview of key groundfish species in the SEA area), and there is no mention of this linkage in Table 5.1. (fish and fish habitat potential environmental interactions).

- It should be noted that sponge grounds are among the more abundant VME indicator species in the SEA study area, but little attention is paid in Table 5.1. to the impacts of potential spills on these large grounds of filter-feeding, habitat forming species; and the spill simulations described in SEA seem to focus on either shoreline/surface impacts or highlights that spills will drift east (beyond 50°W). No attempt to assess the impact of these trajectories on VMEs exists in the current SEA, even though potentially damaging biogenic essential fish habitat could have serious long term impacts on ecosystem productivity.
- Although corals and sponges have been the initial focus in the study of VMEs, many other taxa have been identified as VME indicator species, including tube-dwelling anemones, erect bryozoans, and crinoids, and several physiographic features (e.g. seamounts, canyons, the Southeast shoal) have been identified as VME elements because they contain (or are likely to contain) VMEs (NAFO 2012). These other VME components are not discussed in any detail in the SEA, nor is an assessment of the potential impact of oil and gas exploration/production on them considered.
- Many of the NAFO reports from the Scientific Council meetings since 2008, and the reports from the SC WGEAFM (and references within) summarize most of the available information on VMEs in the SEA study area. These reports should be used not just to describe what is known on VMEs, but also to inform/construct scenarios for spill simulation studies.
- Although not yet available, the upcoming NAFO SC WGESA report (to be released in May 2014) will also contain an updated summary on VMEs, and an analysis of adequacy for current NAFO VME closures. This report will also contain recent findings that suggest that VME areas may be linked to higher fish densities, highlighting the potential importance of these areas for overall ecosystem production. Although it would have been impossible for the SEA drafting team to know these latest unpublished results when putting the SEA document together, the participation of NAFO within the SEA Working Group could have made them aware of this ongoing work, and possibly made available some of the preliminary results for the SEA drafting team.
- Another important source of information that would be useful for preparation of the final version of the SEA is the report of a Convention on Biological Diversity (CBD) Regional Workshop that took place in Montreal, on 24-28 March 2014 and was intended to facilitate the description of ecologically or biologically significant marine areas in the Northwest Atlantic. The international waters within the SEA study area were part of the area considered by this CBD workshop.

Section 4.2.1.3 – Plankton

- Plankton – The role of plankton in nitrogen and carbon cycling is not well explained. The term “biological pump” is misused. It does not refer to benthic pelagic coupling (which is an important process and should be explained) but rather to the sequestration of biogenic carbon in the deep ocean.

- The causal mechanisms of the spring bloom are incomplete. Onset of stratification and the interaction with light availability are key factors. Incorrect use of the term “biological pump” occurs in this section.

Section 4.2.1.4 – Plants and Microalgae

- Several important aspects of macroalgal communities are missing from the SEA. Several types of macroalgae, in particular coralline algae, have depth distributions well in excess of 30 m. Urchin-kelp-coralline algae dynamics are an important determinant of hard substrate communities in our waters (Himmelman and Steele, 1971). The substrate of the Grand Banks has been greatly disturbed by trawling which may affect the distribution of macroalgae. Fishing exclusion zones and artificial reefs may change this and provide refuges for macroalgae. Seaweed zonation with light is an important determinant of distribution. Seaweed communities are vulnerable to oil spills. Therefore coastal seaweed communities and their structure and function should be included in this section.

Section 4.2.1.5 – Benthic Communities

- All Gilkinson and Edinger (2009) citations should be Gilkinson and Edinger (eds.) (2009).
- As different types of benthic communities are sensitive to different types of disturbance, this should be discussed and summarized in a table for easy reference and decision-making.
- Regarding the statement, “...and DFO and NAFO RV surveys...” “...visual assessments also poorly...” What is meant by ‘visual assessments’ here?
- Regarding the statement, “*It is also important to note that characterizations of benthic communities are also inevitably biased according to sampling method. For example, visual assessments often poorly assess infaunal communities whereas grabs may have challenges sampling communities over harder substrates.*” It should also be noted that bottom trawls typically sample only a small fraction of resident benthos, most often larger epibenthos.
- The statement, “*Collectively, these studies confirm that benthic communities in the SEA Study Area are quite diverse compared to higher trophic levels, as well as being somewhat sensitive to anthropogenic effects...*”, requires qualification. When speaking in terms of sand-dominated continental shelves, the global literature on fishing impacts in these habitats indicate that, in many cases, recovery can be relatively rapid (e.g. months). However, in deep-water slope environments inhabited by slow growing, long-lived corals and sponges, recovery could be measured in terms of decades in many cases, if not longer (Gilkinson and Edinger (eds.)(2009)).
- Further to the statement, “Perhaps the most holistic sampling was done on the Grand Banks as part of a series of trawling impact studies (Prena *et al* 1999; Kenchington *et al* 2001), it should be noted that these researchers used video and grabs (Kenchington *et al* 2001) and a benthic sled and trawl bycatch (Prena *et al* 1999)...”
- Table 4.58 – Some non-shellfish species (e.g., sea urchins, polychaetes, sponges etc.) are included in this table summarizing shellfish species.
- Table 4.58 – Regarding the statement, “*Spat settle primarily between August and November at depths of 10-15 m.*”, it should be noted that they also settle in deep offshore water, primarily gravel, on Grand Bank (Gilkinson and Gagnon, 1991).
- Table 4.58 – Information on ‘Pale Sea urchin’ should reference Gagnon and Gilkinson (1994).

- Table 4.58 – Information on ‘surf clam’ is incorrect. Surfclams (*Spisula solidissima*) are mostly confined to warmer waters, which on Grand Bank, is the Tail of the Bank and Southeast Shoal. The species that is harvested commercially north-east of this area is the Arctic surfclam, *Mactromeris polynyma*, with only sporadic occurrences of *S. solidissima*. Contact Elaine Hynick, Science Branch, DFO for more detailed information.
- Table 4.58 – Information on Polychaete worms, states that they occur on a variety of substrates. However, much of Grand Bank is comprised of sandy sediments which support abundant and diverse populations (documented by Kenchington *et al.*, 2001).
- The statement, “Studies to date indicate that, like fish, benthic assemblages respond to environmental variables such as depth, substrate and flow field (Houston and Haedrich 1984; Schneider *et al* 1987).”, requires addition of the following references related to Grand Banks benthos: Gilkinson and Gagnon, 1991; Gilkinson, 2013; Gale *et al.* (in press).
- Amphipod prey includes much more than just seaweed and phytoplankton. They have many diverse and ecologically important feeding modes. Many are scavengers and some are aggressive predators.
- Polychaete information is not comprehensive. The available literature should be used to provide data on diet and ecological roles of these important members of the benthos.
- The statement, “Collectively, sea pens, soft corals, stony corals, and sponges are represented across the shelf, slopes and banks of the Study Area but are found at their highest densities along the slopes, i.e. depths > 200 m.”, requires addition of references Wareham and Edinger (2007); Wareham (2010).
- The statement, “Sponges, in contrast are more widely distributed and high densities can be found along the eastern slopes of the Grand Banks, around the Flemish Cap and along the northern slopes of the SEA Area”, requires a reference.
- Regarding the statement, “In response to the known sensitivity of coral and sponge grounds, many a number of important coral and sponge areas have been designated as Vulnerable Marine Ecosystems (VMEs) (DFO 2012b) and are protected from damaging fishing activities in Canadian and NAFO waters.”, it should be noted that with the exception of a portion of the SW Grand Banks slope closure, these fishing closures occur in the NAFO regulatory area outside Canadian waters.
- Table 4.61 – The final column of this table is difficult to read. The number of digits after the decimal is inconsistent and the information is center justified, both of which are inappropriate formats for displaying such data. A right justified and constant number of digits after the decimal (suggested one digit past the decimal to be sufficient for “summary” statistics where precision is unwarranted).
- Figures 4.70 and 4.71 – The time period covered by the coral and sponge RV records should be stated in the figure titles.

Section 4.2.1.6 – Marine Fish

- Table 4.62 and 4.63 – Tables are listed alphabetically by species. The order of the species should be taxonomic to permit grouping of species into various logical ecological groups.
- Table 4.62 – There is a notable the lack of the most recent publications describing feeding habits and distribution and abundance trends of the three wolffish species found in the study area. The following references should be included in the descriptions for Atlantic Wolffish, Northern Wolffish, and Spotted Wolffish: Simpson *et al.* (2013); Collins *et al.* (2014).

- Table 4.62 – Atlantic Wolffish Habitat and Distribution – Wolffish are found over a variety of substrates (not just “hard clay bottom”), and at depths less than 25 m, and in excess of 250 m.
- Table 4.62 – That Atlantic Wolffish can be retained under SARA, unlike the other two wolffish species, deserves mention, even if this species is not “commercially significant”.
- Table 4.62 – Include fish species as an important component of Cusk diet (Bowman *et al.* 2000). Also include that Cusk is monotypic species in the Northwest Atlantic.
- Table 4.62 – The statement, “A number of research initiatives have also characterized benthic communities on the Grand Banks (Schneider *et al.* 1987; Kenchington *et al.* 2001)”, should include the following references Gilkinson, 2013; Gale *et al.* (in press). Gilkinson (2013) documents benthic communities over areas of Grand Bank as part of the DFO NL NEREUS Ecosystem Research Initiative, which involved a 3-year grab sampling program during multispecies trawl surveys. Gale *et al.* (in press) describe seastar (Asteroidea) assemblages and habitat use over wide areas of the eastern Canadian continental shelf and slope based on DFO survey trawl bycatch records and ROV video.
- Northern Wolffish – The statement “...occurs in Arctic seas on both sides of the North Atlantic Ocean” should be rewritten. Northern Wolffish occurs in both Arctic and Atlantic Oceans – as do other wolffish species, though no mention of this is made. The fact that Northern Wolffish is more pelagic than the other two species should also be noted.
- The statement that Northern Wolffish is distributed as a ‘widespread self-assemblage’, is incorrect. Northern Wolffish are mostly found along the shelf edge, not on the shelf.
- It should be included that, in the past, redfish larvae dominated the ichthyoplankton in many parts of the SEA area (Serebryakov *et al.* 1987).
- The introduction of invasive species and changes to habitat and/or community structure should also be discussed in the context of cumulative effects.
- The statement, “A total of four invertebrate taxa (snow crab, northern shrimp, pink striped shrimp, and shrimp *Pandalus propinquus*) were available from the Canadian Research Vessel surveys (Table 4.60)”, requires clarification. These are the major commercial spp., however many other non-commercial taxa have been processed using standardized protocols during RV surveys since 2005/2006. The point of availability is inaccurate.
- Roughhead Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic, only. A publication by Edinger *et al.* (2007) contains information on Roughhead Grenadier in NL waters. Specifically, it reports that Roughhead Grenadier were found in association with deep-sea corals, such as gorgonians, antipatharians, and soft corals, at depths of 200-1000 m.
- Roundnose Grenadier – The reference Lorange *et al.* (2008) is relevant to the Northeast Atlantic only. In the Northwest Atlantic, the species has been caught at depths less than 400 m. The data provided for NL comes from Parsons 1976. Newer information is available, in Power and Maddock Parsons (1998) and Kulka (2001). Most catches of this species occurred at depths of 900 m or more.
- Spotted Wolffish – Spawning in late autumn and early winter was suggested by Templeman 1966. A more recent publication (Templeman 1986) suggested mid to late summer spawning (July-August-Sept).
- White Hake – White Hake occur at depths much less than 200 m. On the western St. Pierre Bank, and southwest slope of the Grand Bank, they frequently occur at around 100 m (Han

and Kulka 2007). Juvenile White Hake are commonly found inshore, and may even occupy estuaries. Reference to Longfin Hake (*U. chesteri*) is not appropriate.

- White Hake – Not all juvenile White Hake are pelagic. The juvenile stage of the life cycle is characterized by pelagic and (later) demersal components.
- Winter Skate – Kelly and Hanson (2013) estimated that 40-70 egg cases are deposited each year. Also, cephalopods (squid) are an important component of the diet.
- Herring – The occurrence for this species has been recorded up to 450 m in multispecies surveys.
- Capelin – Capelin are found in 3NLOPs in spring RV survey. Include 3K and 2J from fall RV survey. Besides the RV trawl surveys, capelin distribution information is available from annual DFO acoustic surveys.
- The information related to ‘subsequently spent adults...’ is incorrect and wrongly cited. Spent females move out to deeper water after spawning on beaches/bottom sites. Those that survive eventually migrate to offshore feeding areas and likely aggregate with capelin that will be maturing and spawning next year. The timing, the route, and the mechanisms used to migrate from coastal waters to offshore feeding areas have not been knowingly documented.
- Include cephalopods as a major component of the Shortfin Mako diet.
- Include reproduction of White Sharks via internal fertilization, with development characterized by aplacental viviparity (also known as ovoviviparity) with embryonic oophagy. See Saïdi *et al.* 2005.
- Table 4.54 – Capelin spawning on Southeast Shoal takes place in June, July. Capelin also spawn on the bottom in coastal waters.
- Table 4.54 – Capelin spawning time (cumulatively) on beaches and coastal bottom sites and the Southeast Shoal encompasses May, June, July, August.
- Table 4.54 – No corresponding footnote reference exists for superscript #4.
- Table 4.54 – Sandlance spawning season is winter (December-March) not June–August as indicated in the table.
- Table 4.65 – There is much accompanying text around this table related to the inflated representation introduced by comparing numbers among various body sizes (e.g., cod versus sand lance). Agreed this is important – suggested to add a Table be added as a companion table which reports not numbers, but rather weight of catch by species reflecting the biomass of the various species in the SEA area.
- Sandlance – Table 4.65 states Sandlance constitute 6% of RV catch while the text states they constitute 30%.
- Sandlance – The report should include information regarding habitat usage of Sandlance, i.e., burrowing in substrate part of day; migrating vertically to feed; and no distance migrations as are closely associated with their habitat.
- Sandlance – It should be noted that inshore and offshore sandlance are two different species. The report should highlight which species is impacted by any proposed work.

- Atlantic Cod – Other than a line in one of the tables in this section of the report, there is no mention of Atlantic cod, despite the existence of a published Atlantic cod Recovery Potential Assessment in 2011 (DFO-CSAS).

Section 4.2.1.8 – Environmental Influence and Changes

- This section does provide useful information on climate change on fish and invertebrates; however, the context needs to be improved with the addition of information of the role of the North Atlantic Oscillation (NAO) and more comprehensive text on climate change generally (either in the existing text or earlier in sections on the physical environmental setting).

Section 4.2.1.9 – Aquatic Invasive Species

- Table 4.67 – Green crab is also one of the few AIS which are known to destroy fish habitat (i.e., eelgrass), thereby affecting recruitment of some species (e.g., Morris et al 2010).

Section 4.2.1.10 – Ecologically and Biologically Significant Species (EBSAs)

- The recent identification and description of additional EBSAs in the NL Shelves area (DFO 2013) has not been incorporated into this report. The data layers for these EBSAs can be provided upon request. Notably, The Orphan Spur EBSA, and possibly the edge of the Notre Dame Channel EBSA, overlap with the study area.
- Ecologically and Biologically Significant Areas (EBSAs) – *Southeast Shoal and Tail of the Banks*: It should also be noted here that the Southeast Shoal is an area with some of the highest (if not the highest) benthic biomasses recorded anywhere in the world due to the standing biomass of populations of the Arctic wedge clam, *Mesodesma sp.*
- Figure 4.89 – It is unnecessary for EBSAs outside the Eastern NL SEA boundaries to be included.

Section 4.2.1.11 – Other Ecologically Important Areas

- Figure 4.90 – Ecologically Important Areas Identified in the Orphan Basin SEA (2003). The color designation for the Orphan Basin area should be a darker shade to differentiate from the surrounding area.
- Legends provide a color scheme for abundance/biomass/species richness in Figures 4.91-4.93. It is not indicated how these were derived. No units are shown.

Section 4.2.3 – Marine Mammals and Sea Turtles

Given the objectives of the SEA, the document is generally well written as it pertains to marine mammals.

- The information on Pinnipeds (Section 4.2.3.3) needs to be expanded so that harp seals, hood seals and grey seals are treated separately in the summary table (i.e. in the same manner key whale species were addressed). Although there are similarities in the ecology of harps and hoods, there are enough differences that lumping both species together results in a summary table with content that is too general to be useful. The timing and use of ice habitat for whelping needs to be a focus for each of these two species. There is also a climate change aspect that should be presented and discussed (there is published literature on this topic as well as new information becoming available pers. comm. Garry Stenson). Note that a recent publication on satellite movements of hooded seals indicates that there is significant feeding along the shelf edge to the east of the 'Northeast Shelf Slope' EBSA (Anderson *et al.* 2012).

- Note that there are likely harbour seals present along the southern shore of the Avalon Peninsula for most of the year in addition to the Bays along the south coast. Also, note that this March the Convention on Biological Diversity conducted a science advisory workshop to delineate EBSAs in the Northwest Atlantic Area beyond the 200 mile limit. One area that was identified was the shelf break area from the Lilly/Carson Canyon area extending northward to 48° N.

Section 4.3 – Human Activities (4.3.4 Marine Fisheries)

An incomplete (and potentially misleading) description of fishing activities exists in the SEA. Virtually the entire section related to marine fisheries within the current SEA is constructed on the basis of Canadian fisheries, or foreign fisheries which land their catches in Canadian ports. This view of the fishing activities that take place in the SEA study area is limited and incomplete. The entire section related to this topic suggests a distribution of fishing activities that omits entirely the international fisheries operating outside the EEZ managed by NAFO, and therefore most of the maps could mislead an uninformed reader to believe, for example, that there is essentially no fishing going on in the Flemish Cap, or that the Sackville Spur has no fishing whatsoever, when in reality this is one of the areas in the region that has the highest levels of fishing effort (e.g. NAFO 2012a).

Explicitly, it is not implied that these omissions and shortcomings are intentional, but it is highlighted that they effectively render the entire analysis of marine fisheries useless. The SEA states, *“Although the DFO datasets are known not to be comprehensive, particularly with regard to important inshore fisheries, the information provides a useful regional picture of fishing activity in the area that is considered adequate and appropriate for the purposes of the SEA”*. However, this cannot be assumed true. Offshore, without integrating the information from Canadian and international fisheries it is impossible to assess if the picture provided is adequate and appropriate. As such, the entire section on marine fisheries should be redone to incorporate international fishing effort data. These data, in aggregated format, could be requested from the NAFO Secretariat. Note also that Campbell and Feridzon (2013) provide data for fishing vessel activity in the areas governed by NAFO for 2011 and 2012.

To permit a general visual comparison of fisheries activities in the study area with and without inclusion of NAFO data, see Figure 1; Appendix 1 that compares Figure 4.122 from the SEA report (commercial fishing locations in 2008-2012) and Figure 4.2.2.1.7 from NAFO (2012a) (common fishing effort areas derived from VMS data in 2008-2011). Such information should be combined with the fishing effort information from DFO to provide a complete picture of fishing in the SEA area.

Section 5 – Environmental Interactions, Mitigation and Planning Considerations

In general, with regards to environmental interactions, mitigation and planning considerations, the report presents an overview of some of the possible interrelationships resulting from potential offshore oil and gas activities on the Grand Bank and adjacent areas (e.g., Table 5.1) by listing the major activities related to seismic surveys, exploration, drilling and production activities, and how these activities might potentially impact fish and fish habitat, while considering results from previous studies and other sources of available information. However, some areas remain vague in this regard, as do many of the environmental mitigation measures.

Section 5.1 – Fish and Fish habitat (effects assessment)

- This section is a weak summary of other summaries. It is not comprehensive and will not serve as a useful reference. Our understanding has changed dramatically with the research following the Macondo blowout. This should be reflected in this summary.

- Table 5.1 – Information in the table is not adequate. The table is incomplete and often cites reviews of reviews. It is noted in the header that the table is a “Summary of Some Known and Potential Environmental Effects Based on Available Information Sources”. This implies that a thorough job of reviewing and summarizing the existing literature for this aspect of the report was not undertaken.
- Table 5.1 – It should be noted that accidental spills of oils or other substances onto the Southeast Shoal during the period capelin are spawning, eggs are incubating, and yolk sac larvae are in the sediment could have a negative impact on that year class and subsequent spawning biomass.
- The bullet, “Changes in the presence, abundance, distribution and/or health of fish and invertebrates...” is vague. Direct mortality of marine organisms (at various stages of development) resulting from exposure to oil pills should be stated explicitly instead.
- Produced water effects should include increased nutrient loading and the ecosystem consequences for benthic pelagic coupling and production (Rivkin *et al.* 2000).
- Tannen *et al.* (2nd line) is cited incorrectly. The effects found relate to increased oxygen demand not oxygen enrichment. Produced water effects in this section are related to discharge not flaring. Rye *et al.* (2003) is not in the list of references.
- Mitigations for ballast water introduction of invasive species are included, but not for fouling organisms on hulls, drilling rigs or equipment. Protocols for mitigation of these introduction vectors should also be included in this section.
- It is indicated that the Southeast Shoal is a nursery for yellowtail flounder. However, it should also be acknowledged that the Southeast Shoal is the only spawning site for the Southeast Shoal capelin stock.
- The report suggests as a mitigation procedure ‘*avoiding species at risk where possible during the planning and conduction of oil and gas activities in the offshore*’. However, since the three wolffish species are found throughout the study area, no practical avoidance exists. What should be a practical mitigation measure in the case of wolffish or white sharks?
- There are no considerations in the report regarding accidental oil spills vis-à-vis fish species at risk and their habitat. This study includes the spatial distribution of abundance indices for the three wolffish species; and potential spatial and temporal trajectories of oil spills have been modelled and/or simulated in previous studies (e.g. Net Environmental Benefit Analysis of Dispersant Use for Responding to Oil Spills from Oil and Gas Facilities on the Newfoundland Grand Banks, 2013); both sources of information could be used to assess the impact of oil spills on the wolffish populations components found in the study area and could also be used as a framework for identifying appropriate mitigation measures in the case of oil spills.

Section 5.3 – Marine Mammals and Sea Turtles (Effects Assessment)

This section of the document is generally well written as it pertains to marine mammals given the objectives of the SEA. However, it is noted the sections on Important Areas and Times for each of the key VEC species groups (e.g. Marine Mammals and Sea Turtles - 5.3.3.2) have considerable repetition from earlier sections of text. While some of this is warranted, there should also be an effort to link this information with the appropriate mitigation measures presented in each of the preceding sections of text.

- The risk from ingestion of floating debris (i.e. plastic bags) for turtles should be discussed and garbage management and on shore disposal proposed as mitigations.

Section 5.4 – Sensitive and Special Areas (Effects Assessment)

- The effects of drilling wastes on sensitive and sessile benthic species such as corals and sponges is not well understood. However, since they are filter feeders and known to be sensitive to increased sedimentation, organic matter loading and quality of suspended particulate material it can anticipated that they will be negatively affected. There is also very little information on the potential effects of seismic exploration on these organisms. These aspects should be highlighted as a critical information gap within this consideration of sensitive and special areas.
- The mitigation for cumulative effects is to reduce overlap of projects. This is not realistic. Overall this section is inadequate and does not summarize or address the potential for cumulative effects. It should include interactions between activities as well as thresholds for effects and consider climate, habitat and foodweb change as possible drivers.
- This section implies that only designated VMEs and Coral Areas will be considered in this section. Other coral and sponge populations are only briefly referred to in the ecosystem overview and generally ignored in the assessment of potential effects.

Section 5.6 – Cumulative Environmental Effects

This section is very superficial as presented. It is noted within the report that information on cumulative effects is undeveloped here because upcoming projects and their footprints are unknown. However, there is there is also no attempt to describe how cumulative effects are currently being assessed nor is there acknowledgment and discussion regarding the advancements in cumulative effects research in recent years. These issues need to be addressed.

Specifically regarding the issue of unknown projects and unknown project footprint sizes as an explanation for providing no relevant industry information, it is noted that it is indicated elsewhere in the current SEA and on the C-NLOPB website that up to ten Environmental Assessments for petroleum exploration/production activities are in progress. At the very least, an overview and time line of these activities should be presented here.

Note: DFO conducted a National Science Advisory Process to develop a new framework for large project cumulative effects on marine mammals in March 2014 – contact J. Lawson for details on when this information will become available.

Section 5.7 Information Availability, Requirements and Opportunities

Coral and sponge effects and sensitivity should be identified as a significant information gap.

Section 6 – Summary and Conclusions

Page 444 – Regarding the “**C-NLOPB Note: Recommendations and conclusions regarding the issuance of rights and any requirement on the restriction of offshore oil and gas activities in the SEA Study Area will be finalized for inclusion in the Eastern Newfoundland SEA Report following the conclusion of the regulatory and public comment period.**”, It is not clear what this note means. Does it mean that if DFO/NAFO wants to extend the closure of the coral and sponge VMEs to other human activities that CNLOPB will include this in the SEA?

CONCLUSION

In conclusion, the quality of scientific content presented in the SEA varies across the sections. While the SEA document contains a large volume of information and valuable data, it is not complete in its current form. The SEA fails to incorporate many important and relevant data sources (e.g. non-Canadian surveys and analyses derived from them) and overlooks many important and basic considerations on ecosystem structure and function. It also does not adequately explore to the potential impacts on ecosystem functioning. Suggested changes/updates resulting from this review should be considered before the document can be considered a reliable source of guidance for policy and management decision-making.

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Approved by

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April 16, 2014

Sources of information

This Science Response Report results from the Science Response Process of April 2014 for the Science Review of the Eastern Newfoundland Strategic Environmental Assessment (SEA).

Additional publications from this meeting will be posted on the [\(DFO\) Science Advisory Schedule](#) as they become available.

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Appendix 1: Figures

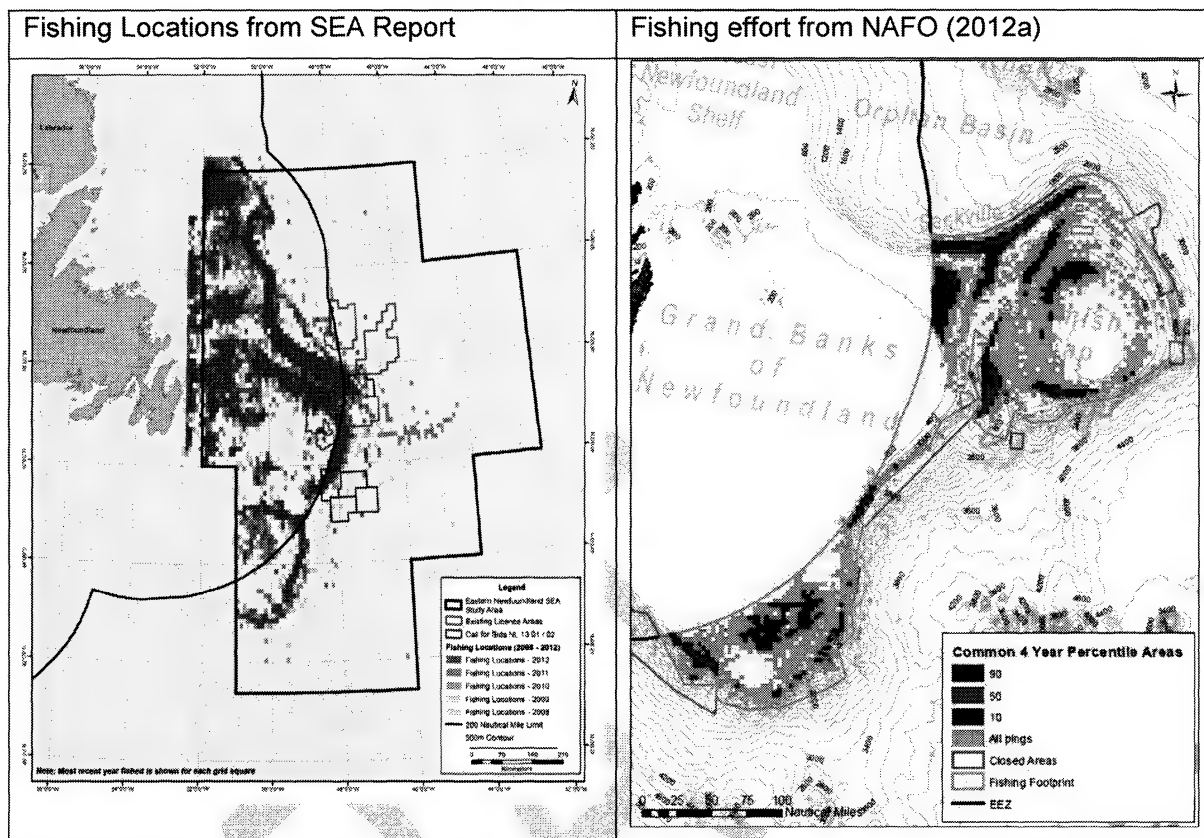


Figure 1. Comparison of Fishing Locations mapping from the Eastern Newfoundland SEA (Sea and NAFO-Figure 4.122 from the SEA report- commercial fishing locations in 2008-2012-) and common fishing effort areas in the NAFO Regulatory Area in 2008-2011 derived from NAFO VMS data (Figure 4.2.2.1.7 from NAFO (2012a)).

This Report is Available from the

Center for Science Advice (CSA)
Newfoundland and Labrador Region
Fisheries and Oceans Canada
PO Box 5667
St. John's, NL A1C 5X1

Telephone: (709) 772-3688

E-Mail: DFONLCSA@dfompo.gc.ca

Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-3769

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Correct Citation for this Publication:

DFO. 2014. Update of Stock Status Indicators for Northern Shrimp, *Pandalus borealis*, in Shrimp Fishing Areas 4, 5 and 6. DFO Can. Sci. Advis. Sec. Sci. Resp. 2014/nnn.

Aussi disponible en français :

MPO. 2014. Mise à jour des indicateurs de l'état du stock pour la crevette nordique (*Pandalus borealis*) dans les zones de pêche de la crevette 4, 5 et 6. Secr. can. de consult. sci. du MPO, Rép. des Sci. 2014/nnn.

APPENDIX – Suggested Additional Literature Regarding Marine Mammals and Sea Turtles

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Richards, Dale E

De: Bourgeois, Chuck
Envoyé: January-14-13 7:09 AM
À: Richards, Dale E
Cc: Veinott, Geoff
Objet: FW: Science input on the Western NL Offshore Area SEA update - January 14th deadline

Hi Dale

Geoff reviewed on behalf of the Section - his comments are below.

Regards

C.E. Bourgeois
Section Head, Salmonids
Aquatic Resource Division
P O Box 5667, St. John's, NL. A1C 5X1
Tel. 709-772-2128 Fax: 709-772-3578
E-Mail: chuck.bourgeois@dfo-mpo.gc.ca

From: Veinott, Geoff
Sent: January 9, 2013 4:00 PM
To: Bourgeois, Chuck
Subject: RE: Science input on the Western NL Offshore Area SEA update - January 14th deadline

Chuck, I've gone over the relevant sections of the report and have only minor comments.

In Section 4.1.1.5 there is a discussion of the Petroleum Vulnerability Index for the shoreline. The areas most vulnerable to an oil spill appear to be the mouths of our Atlantic Salmon Rivers (Table 4.1). These areas range from ratings of moderate to high to extreme in their sensitivity index. However, the connection between the sensitivity of these areas and the fact they are the mouths of salmon rivers is not made. These areas would also be staging areas for smolt and Adult salmon. Most of the current drilling activity is occurring on-shore so it is likely that any spill would impact these near shore areas. There is no mention of the impact an oil spill would have on the returning adult salmon's ability to home to its natal stream. I suspect this research has never been done.

The report does acknowledge that smolt migrate through the SEA area. However, recent research by Dempson showed that smolt can spend several weeks in the Conne River estuary. Therefore, the report may be underestimating the importance of estuaries to salmon smolt as they leave their natal rivers.

In section 4 there is no mention of adult Atlantic salmon migrating out of St. Georges Bay and in Fig 4.3.2 there appears to be no migration of adult salmon within the boundaries of the SEA area.

The Report's information on American eel life history (Dutil 1989) is outdated. Table 4.3.5 American eel can and do take up permanent residency in estuaries. The burrow into the substrate and are found in estuaries during the winter.

Section 5.1.3.1 does not mention that American eel which are designated as threatened will migrate through the gulf as larval eels (leptocephali) or glass eels (quite likely by the millions) in the spring and adults will migrate through the area in the fall.

If you have any questions let me know.
Geoff

From: Bourgeois, Chuck
Sent: January 2, 2013 7:10 AM
To: Veinott, Geoff

Subject: FW: Science input on the Western NL Offshore Area SEA update - January 14th deadline

Hi Geoff

Could you please review this on behalf of the Section?

Regards

C.E. Bourgeois
Section Head, Salmonids
Aquatic Resource Division
P O Box 5667, St. John's, NL. A1C 5X1
Tel: 709-772-2128 Fax: 709-772-3578
E-Mail: chuck.bourgeois@dfo-mpo.gc.ca

From: Richards, Dale E
Sent: December 31, 2012 10:57 AM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Bourgeois, Chuck; Stansbury, Don; Parsons, Dawn; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan
Cc: Mansour, Atef A H; Sheppard, Lee; Coughlan, Geoff; Davis, Ben
Subject: Science input on the Western NL Offshore Area SEA update - January 14th deadline

Good morning,

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I have placed a copy of the SEA document on the shared science drive in the CSA review folder: M:\CSA Review\Western NL Offshore Area SEA. It is also publically available in an FTP folder. To connect to the FTP folder enter the following FTP url into your internet browser or your windows explorer address field:

<ftp://ftp1.dfo-mpo.gc.ca/GullageM>

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4.1.2 Bathymetry

4.1.4 Oceanography

4.2 Biological Environment

4.2.1 Fish and Fish Habitat

4.2.3 Marine Mammals and Sea Turtles

4.3.5 Commercial Fisheries - **when drafted**

5 Environmental Interactions, Mitigations and Key Planning Considerations

5.1 Fish and Fish Habitat (including Species at Risk)

5.3 Marine Mammals and Sea Turtles (including Species at Risk)

5.4 Protected and Sensitive Areas

If you have any questions or concerns about this review please contact me.

Thank you,

Dale

...and Happy New Year!

E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

Newfoundland and Labrador Region / La Région de Terre-Neuve et du Labrador

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Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO

<http://www.dfo-mpo.gc.ca/csas-sccs/>

Richards, Dale E

De: Clarke, Keith
Envoyé: January-14-13 2:55 PM
À: Richards, Dale E
Cc: Dalley, Kate L
Objet: FW: Science input on the Western NL Offshore Area SEA update - January 14th deadline

Dale

Here are a few comments from Kate Dalley, if other arrive today I will forward them as well (I have asked Robin Anderson and Jerry Payne to have a look).

Keith D. Clarke
Section Head, Ecological Sciences Section
Science Branch | Section des sciences
Fisheries and Oceans Canada | Pêches et Océans Canada
PO Box / CP 5667
St. John's, Newfoundland and Labrador | Terre-Neuve et Labrador
A1C 5X1
Telephone / Téléphone: (709) 772-2907
Facsimile / Télécopieur: (709) 772-5315
E-mail: keith.clarke@dfo-mpo.gc.ca

From: Dalley, Kate L
Sent: January 14, 2013 2:49 PM
To: Clarke, Keith
Subject: RE: Science input on the Western NL Offshore Area SEA update - January 14th deadline

Hi Keith,

My input on the Western NL Offshore Area SEA update is attached.



Memo CNLOPB
Western NL SEA ...

Let me know if you have any questions.

Cheers,
Kd

From: Clarke, Keith
Sent: January 4, 2013 10:47 AM
To: Dalley, Kate L
Subject: FW: Science input on the Western NL Offshore Area SEA update - January 14th deadline

From: Clarke, Keith
Sent: January 2, 2013 8:39 AM
To: Anderson, M. Robin; Gregory, Robert; Payne, Jerry F
Cc: Hanlon, Jacqueline M.

Subject: FW: Science input on the Western NL Offshore Area SEA update - January 14th deadline

The first one of the year. Could you let me know if you can review?

Keith

From: Richards, Dale E
Sent: December 31, 2012 10:57 AM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Bourgeois, Chuck; Stansbury, Don; Parsons, Dawn; Clarke, Keith; Senciall, Dave; Mabrouk, Gehan
Cc: Mansour, Atef A H; Sheppard, Lee; Coughlan, Geoff; Davis, Ben
Subject: Science input on the Western NL Offshore Area SEA update - January 14th deadline

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If you have any questions or concerns about this review please contact me.

Thank you,

Dale

...and Happy New Year!

E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

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E-mail / Courriel: Dale.E.Richards@dfo-mpo.gc.ca

Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO

<http://www.dfo-mpo.gc.ca/csas-sccs/>



To
À

Keith Clarke
Section Head
Ecological Sciences Section

From
De

Kate Dalley
Ecological Sciences Section
Environmental Sciences Division

Security Classification - Classification de sécurité
Non classifié/Unclassified
Our File - Notre référence
Your File - Votre référence
Date
30 November 2018

Subject
Objet

Request for Input on the Western NL Offshore Area SEA Update

I have reviewed the **C-NLOPB Western NL SEA Update- DRAFT 1** intended to proactively examine the environmental issues that may be associated with development in the Western NL Offshore area. These SEA results are intended to be considered in any future licensing and permitting decisions by the C-NLOPB regarding offshore petroleum activities in the area. In general, I found the material to be appropriate and fairly comprehensive. I do, however, have some suggestions for consideration that may enhance the clarity and improve completeness. My suggestions are presented below:

Section 4.2.1.3 Benthos and Coastal Habitats,

a. Corals:

The following paper should be critical in illustrating the relationship of deep sea corals to fish larvae (particularly for the COSEWIC special concern redfish species)

Sandrine Baillon, Jean-François Hamel, Vonda E Wareham, and Annie Mercier. 2012. Deep cold-water corals as nurseries for fish larvae. Frontiers in Ecology and the Environment 10: 351–356. <http://dx.doi.org/10.1890/120022>

b. The following references will provide additional insight to the importance of eelgrass and nearshore habitats, respectively:

DFO. 2009. Does eelgrass (Zostera marina) meet the criteria as an ecologically significant species? DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/018. http://www.dfo-mpo.gc.ca/CSAS/Csas/Publications/SAR-AS/2009/2009_018_e.pdf

David Cote, Robert S. Gregory, Corey J. Morris, Brianna H. Newton, and David C. Schneider. 2013. Elevated habitat quality reduced variance in fish community composition. Journal of

Experimental Marine Biology and Ecology 444:22-28.
<http://dx.doi.org/10.1016/j.jembe.2012.11.006>,

Section 4.2.1.4 Aquatic invasive species are discussed on page 157-158. This threat has not been acknowledged or further developed in section 5. Discussing the potential for the spread of aquatic invasives should be an important planning consideration.

See the following for information on the potential impact of aquatic invasive species on NL environment due to ballast water exchange:

McKenzie, C.H., G. Han, M. He, T. Wells and G. Maillet. 2011. *Alternate Ballast Exchange Zones for the Newfoundland and Labrador Region – An Aquatic Invasive Species Risk Assessment Based on Oceanographic Modelling, Ecologically and Biologically Significant Areas and the Sustainability of Fisheries and Aquaculture*. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/087. viii + 39 p.
http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/resdocs-docrech/2010/2010_087_e.pdf

Distribution maps would be informative for this SEA. See the following webpage for additional information and distributions of these organisms in the update area:

<http://www.nfl.dfo-mpo.gc.ca/AIS-EAE>

Section 4.2.1.6 There is an inconsistency between the text in the third paragraph on page 182 “There are currently four marine fish species...” and the accompanying Table 4.40. To avoid confusion, either keep the text and table consistent, or explain why the banded killifish has not been discussed as a SAR when it appears in the table under a species of concern (page 183); Table 4.40 is referenced throughout the text elsewhere without explanation of the exclusion of this species of concern. (Similar inconsistencies were noticed in section 4.2.3.6)

Section 5.1 largely disregards potential inshore effects. As briefly discussed in section 2.2.2.3, future development may incur onshore effects through horizontal drilling, increased traffic, mooring etc. Potential effects and mitigation and planning considerations for the inshore should be developed. As one example, in Table 5.1 under the ‘Vessel Traffic’ component, introduction and spread of aquatic invasive species and resulting habitat degradation should be included. See:

Morris, C.J., Gregory, R. S., Laurel, B.J., Methven, D.A., and Warren, M.A. 2011. *Potential effect of eelgrass (Zostera marina) loss on nearshore Newfoundland fish communities, due to invasive green crab (Carcinus maenas)* DFO Can. Sci. Advis. Sec. Res. Doc. 2010/140. iv + 17 p.
http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/resdocs-docrech/2010/2010_140_e.pdf

Figure 5.1 Would benefit from information about eelgrass (ecologically significant species) distributions. See page 17 in:

Templeman, N.D. 2010. *Ecosystem Status and Trends Report for the Newfoundland and Labrador Shelf*. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/026 vi + 72 p.
http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/resdocs-docrech/2010/2010_026_e.pdf

Section 5.1.5, page 280. As presented, statements including "...will *likely* be separated enough in space and time that cumulative effects are *unlikely* to occur" and "...these are therefore *unlikely* to overlap in space or time", are weak and unsubstantiated. These will want to be supported by specific mitigation options for EAs of any future developments.

Section 5 Throughout this section, possible mitigation options and considerations are presented. With the exception of the final paragraph in section 5.5.2, page 305, there is no discussion of options if mitigation measures are not successful. Section 2.2.2.7 offers some options for compensation of personal monetary or goods losses, but it would be appropriate to discuss compensation options for environmental losses (e.g. Environmental Protection Plan (EPP)).

Please do not hesitate to contact me if you have any questions or require further clarification.

Kate Dalley
Ecological Sciences
Science Branch, NL Region

Richards, Dale E

De: Power, Don
Envoyé: January-14-13 5:25 PM
À: Richards, Dale E
Objet: RE: Science input on the Western NL Offshore Area SEA update - January 14th deadline

Hi Dale,
I only have two comments after my review of these various sections (attached).
Don



Comments on
Western NL Offs...

From: Richards, Dale E
Sent: December 31, 2012 10:57 AM
To: Power, Don; Simpson, Mark R; Stenson, Garry; Mowbray, Fran; Bourgeois, Chuck; Stansbury, Don; Parsons, Dawn; Clarke, Keith; Sencially, Dave; Mabrouk, Gehan
Cc: Mansour, Atef A H; Sheppard, Lee; Coughlan, Geoff; Davis, Ben
Subject: Science input on the Western NL Offshore Area SEA update - January 14th deadline

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Thank you,

Dale

...and Happy New Year!

E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

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Comments on Western NL Offshore Area SEA Update (Jan 14, 2013)

D. Power:

Note. The page numbers referred to here correspond to the numbering system in the document, not the pdf page numbers.

(1) Page 143, Table 4.3.4, Section dedicated to Roughnose grenadier (*Trachyrhynchus murrayi*)

Comment: (a) this species is uncommon but not rare in multispecies RV surveys conducted by DFO NL Region in SA2+3. The current description is no longer adequate.

(2) Page 279-280, Section 5.1.4 the following statement is made in each of these sections for fish, birds and marine mammals (bolded text emphasized by DPower) : "...This anticipated level of exploration in the Western NL Offshore Area and the relatively short-term nature of these individual actions will likely mean that seismic surveys and drilling programs (and possibly, any development projects) will likely be separated enough in space and time that **cumulative effects are unlikely to occur.**" A similar statement is made on page 288, Section 5.2.4 for marine birds.

Comment: The SEA is generally comprehensive and up to date in the presentation of information about VECs within the area, their distribution and relative abundance (based on RV surveys). However, it is unclear how this statement can be made in the SEA without identifying the assessment methodology used to arrive at this conclusion. It is assumed that this ("...cumulative effects are unlikely to occur.") is a speculative statement and should be identified as such by the consultant.

Richards, Dale E

De: Lawson, Jack
Envoyé: January-15-13 4:18 PM
À: Richards, Dale E; Stenson, Garry; Sjare, Becky
Objet: Emailing: Oil and Gas EA responses - AMEC-C-NLOPB Western NL EA Update Review - Lawson - Jan 2012.docx
Pièces jointes: Oil and Gas EA responses - AMEC-C-NLOPB Western NL EA Update Review - Lawson - Jan 2012.docx

Hi Dale, I have attached a Word document with my comments on revised west coast SEA by the C-NLOPB. Many of the general comments reflect the usual issues, [REDACTED] I wish you luck with the final roll-up of all the comments.

Regards, Jack

s.21(1)(b)

Lawson (Marine Mammal Section, DFO) Review of "Western Newfoundland & Labrador Offshore Area Strategic Environmental Assessment Update" By C-NLOPB.

Science Response	Applies to Sections or Pages
While the probability of a large-scale oil spill is low, operators off western NL will have to contend with ice for part of the year – not a factor in the recent Gulf oil spill. This should be discussed in light of what it would mean for spill propagation and the severe limitations for oil recovery efforts. The "worst case" might be a spill under ice, rather than a strong wind event.	p. 33, 36, 64, and elsewhere
DFO and MUN researchers have sighted sperm whales many times in shallow water, and close to the coastline in southern Newfoundland and occasionally in similar situations on the SW and west coasts of Newfoundland.	p. 225
A National Defense Reconnaissance aircraft recorded video of a group of more than 100 beluga swimming southwards near the coast off Port aux Port in the winter last year, so it is possible that beluga could be seen in this area during any time of year.	p. 226
Blue whales are another Species at Risk that are found in the Laurentian Channel Area of Interest	p. 259
The mitigation measures listed in the SEA are far too generic and do not have much detail. There have been enough operations and associated recommendations to provide more detailed "minimum" practices, such as those described in the Federal Guide. If mitigations are warranted for proposed exploration activities in the Western NL area, they should be clearly identified and described in the SEA. This proactive approach would provide readers with a level of certainty regarding the nature and potential effects of oil and gas exploration activities in this area.	p. 292-294, 297-298
Seismic operators should seek to provide dedicated and experienced personnel (not necessarily restricted to one individual) to act as marine mammal observers on board the seismic vessel. The use of FLOs or crewmembers to conduct monitoring is not appropriate as they are busy with other duties. Given the paucity of information regarding marine mammal abundance, distribution and reactions to seismic operations in the study area, using a dedicated and qualified marine mammal observer will provide both (1) a significant improvement in monitoring, and (2) reliable new information on marine mammals in this area. DFO encourages the development of the best possible monitoring program that will produce and distribute important sighting data for marine	p. 293

mammals, and other marine species seen at or near the surface. Such monitoring should be conducted using a set of consensual guidelines with the object of providing the best possible data.	
Significant knowledge gaps exist in this study area, and other areas around Newfoundland and Labrador. We again urge regulators to implement a class screening document for exploratory and production oil and gas activities on the shelf regions of Newfoundland and Labrador that is complementary to the 1998 Scotian Shelf document. This must include a better discussion of sound propagation and biological impacts, especially given the known biological and physical differences between that area and the proposed project area.	General comment
Every effort should be used to ensure that good observer data is collected – in particular the number of hours ON EFFORT to collect the sightings data (which could be used to provide and estimate of species density in the survey area). Do the future offshore development proponents intend to collect a similar level of information for these marine megafauna? It would be far more useful, but would require better observer training and more observer effort – neither of which is well-described in this document as requirements.	General comment
Two or three seismic programs in the same area offer the risk of single and cumulative effects (i.e. there is a risk that a marine organism may be exposed to seismic sounds frequently, and potentially at levels high enough to cause displacement). DFO agrees with the SEA authors that subsequent project-specific EA documents address this issue if multiple operations are planned.	General comment
While it is likely that significant anthropogenic noise exists in the study area, site-specific measurements are not cited. As a precautionary approach, “pre-oil industry” sound measurements (and sound propagation measures) should be conducted to determine a baseline from which to compare future monitoring activities. Further, DFO strongly recommends that field measurements be conducted during any proposed seismic operations to verify the predictions of the model(s) used to conduct the assessment. Further, despite a number of published and “grey” literature studies, there remains a need for empirical data (and modeling) of the seismic zones of critical influence given the design of the seismic array being used. It is recommended that directed studies of sound propagation and marine species’ reactions	General comment

Centre for Science Advice – NL Region

Lawson - Jan, 2013

to seismic sounds be conducted in the waters of this Region.	
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Richards, Dale E

De: Anderson, M. Robin
Envoyé: January-15-13 4:19 PM
À: Richards, Dale E
Cc: Clarke, Keith
Objet: Review of western nl sea

Hi Dale,
Please find attached my review of the Western NL draft SEA update. Let me know if you need anything else or have any questions.
Robin



**Review of the
Western Newfo...**

M. Robin Anderson, PhD
Marine Habitat Research Scientist
Ecological Sciences Section
Environmental Science Division
Science Branch, Fisheries and Oceans Canada
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Review of the Western Newfoundland & Labrador Offshore Area Strategic Environmental Assessment Update Draft #1

By M. Robin Anderson

January 15th, 2013

As requested, I have reviewed the **Western Newfoundland & Labrador Offshore Area Strategic Environmental Assessment Update Draft #1** and have the following comments.

Oil Spill Modelling The oil spill models referenced in the SEA do not incorporate the new understandings of gas and oil behaviour and fate that resulted from the Macondo blowout in the Gulf of Mexico. Much of the relevant findings are now published and should be summarized in the SEA document and incorporated into any future modeling and planning exercises.

The risk, fate and effects of an oil spill or gas blowout under ice need to be analysed and summarized.

Coastal habitats The description of coastal habitats is very brief and their importance from the point of view of system productivity is not discussed. The only exception is kelp on the Quebec north shore which is outside the study area.

Most of the SEA information and analysis is compiled on a spatial scale that is suitable for offshore environments. The diversity and sensitivity of the coastal zone is not well captured at this scale. The SEA presents the results of coastal zone geomorphology and sensitivity studies of Cato (2011) but does not make any further use of them in the identification of habitats and areas of particular sensitivity from a fish and fish habitat perspective.

Eel grass beds are recognized as sensitive habitat around the world. They are mentioned briefly in the SEA but their locations in the study area are not mapped or identified. Similarly, estuaries in the study area should be identified and the important fish species associated with them listed.

Fish species Rainbow smelt are mentioned in the discussion of anadromous species but biological and ecological information is not included in Table 4.34.

Sea trout populations occur in the study area but are not mentioned in the SEA. They should also be included in Table 4.34.

Aquatic invasive species AIS are mentioned briefly in the report but the risks of introduction are not considered. This is a significant concern for the Western NL SEA as the study area includes coastal areas that are vulnerable to AIS

introduction. Drilling platforms and rigs are often moored at a location for periods of time that allow them to pick up “hitchhikers” and then to unload those organisms or their propagules at the drilling location. Fouling communities on support vessels and barges are also a concern. Information on the NL Region AIS program can be found at www.nfl.dfo-mpo.gc.ca/AIS-EAE. The SEA should include a list of the species currently found in Newfoundland in other areas, particularly those where oil rigs and associated vessels may be moored for a period of time. A list of other potential invaders (eg those in other parts of the Gulf) should also be included. Table 5.1 should include the risks of AIS introduction from vessels and platforms.

Fish and fish habitat response to oil spills Large numbers of studies of the response of the marine environment including fish and fish habitat to the Macondo oil spill are now published and available in the literature. These advances in our understanding of the consequences of oil and gas introductions into the marine environment should be summarized here.

Mitigations Avoidance of sensitive areas or times is proposed in section 5.1.2 as a mitigation for potential effects of oil and gas activities in the SEA. This presumes that sensitive areas have been identified before or during planning of operations. The SEA document has not done this at the scale that is relevant to the coastal zone except for referencing Cato’s 2011 work. Sensitive areas of the coastal zone should be identified and any lacking information should be indicated in section 5.1.5 Information availability and requirements.

P136 The first paragraph on estuaries and their importance should be updated. The Corell (1978) reference is useful but dated. Recent work such as that of Greenlaw et al (2011) might be more relevant.

P156 There is no evidence that lobster populations on the coast of Newfoundland are regulated by river runoff. This may be relevant to areas in the Gulf that are significantly influenced by the productivity fluctuations determined by variation in the outflow from the St Lawrence River.

Figure 4.32 Does not show movement back to natal rivers in the study area. There are a number of very important salmon rivers in the study area and this information and the specific timing of the runs is available and should be included.

Figures 4.36-4.48 The number of tows for each year of RV survey data included on the maps of fish distribution and abundance would be helpful in the interpretation of these figures. If the number of tows is similar from year to year then a map of the tow locations would also be helpful.

References

Catto, N.R. (2011). Coastal Erosion in Newfoundland. Newfoundland & Labrador
Ministry of Environment and Conservation.

Correll, D.L. (1978). Estuarine productivity. *BioScience*, 28, 646-650.

Greenlaw, M. E., Roff, J. C., Redden, A. M. and Allard, K. A. (2011), Coastal zone
planning: a geophysical classification of inlets to define ecological representation.
Aquatic Conserv: Mar. Freshw. Ecosyst., 21: 448–461. doi: 10.1002/aqc.1200

If you have any questions about these comments or require additional information, please
do not hesitate to contact me.

Robin Anderson

Richards, Dale E

De: Richards, Dale E
Envoyé: January-19-13 3:57 PM
À: Coughlan, Geoff
Cc: Sheppard, Lee; Mansour, Atef A H
Objet: Comments from Science on the Western NL Offshore SEA Update

Hi Geoff,

As mentioned on Friday, please find attached the Science review of the Western NL Offshore SEA Update. I am sending you this unapproved memo in advance of Regional Science Management signatures to permit you the time needed to draft the Oceans/DFO collated response.

Please do not forward the science comments (contents of the memo) elsewhere until all Science management approvals are in place and the official final version (signed by the RDS) has been received by Ray's office.

If you have any questions please contact either Lee or Atef, as I will be in Ottawa next week.

Thanks so much for the deadline extension on this request.



Memo - 2013
Western NL Offs...

Lee, I have put the 'green' sign-off folder under your office door and if you and Atef could expedite the approvals of this file on Monday morning, it would be appreciated. Also, Lee thanks for your edits on this memo...I incorporated almost all of them.

Cheers,
Dale

E. Dale Richards, B.Sc. Hons., M.Sc.
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<http://www.dfo-mpo.gc.ca/csas-sccs/>



Fisheries and Oceans
Canada

Pêches et Océans
Canada

MEMORANDUM

NOTE DE SERVICE

To
À

R. Finn
Regional Director Ecosystem Management

From
De

B. McCallum
Regional Director Science

Security Classification - Classification de sécurité Non classifié/Unclassified
Our File - Notre référence
Your File - Votre référence
Date January 16, 2013

Subject
Objet

Science review of Western Newfoundland and Labrador Offshore Area SEA Update

The Oceans Division of the Ecosystem Management Branch recently requested a Science review of the **Western Newfoundland and Labrador Offshore Area Strategic Environmental Assessment (SEA) Update Draft #1**. The following comments have been provided by Ecological Sciences, Groundfish, Marine Mammals, and Salmonids. The report is also being reviewed independently by Science in the Quebec Region.

General Comments

- Significant knowledge gaps exist in this study area and other areas around Newfoundland and Labrador. We again urge regulators to implement a class screening document for exploratory and production oil and gas activities on the shelf regions of Newfoundland and Labrador that is complementary to the 1998 Scotian Shelf document. This must include a better discussion of sound propagation and biological impacts, especially given the known biological and physical differences between that area and the proposed project area.
- Every effort should be used to ensure that good observer data is collected – in particular the number of hours “on effort” to collect the marine mammal sightings data (which could be used to provide and estimate of species density in the survey area). Do the future offshore development proponents intend to collect a similar level of information for these marine megafauna? It would be far more useful, but would require better observer training and more observer effort – neither of which is well-described in this document as requirements.
- Two or three seismic programs in the same area offer the risk of single and cumulative effects (i.e. there is a risk that a marine organism may be exposed to seismic sounds frequently, and potentially at levels high enough to cause displacement). Fisheries and Oceans Canada (DFO) agrees with the SEA authors that subsequent project-specific Environmental Assessment (EA) documents address this issue if multiple operations are planned.

- While it is likely that significant anthropogenic noise exists in the study area, site-specific measurements are not cited. As a precautionary approach, “pre-oil industry” sound measurements (and sound propagation measures) should be conducted to determine a baseline from which to compare future monitoring activities. Further, DFO strongly recommends that field measurements be conducted during any proposed seismic operations to verify the predictions of the model(s) used to conduct the assessment. Despite a number of published and “grey” literature studies, there remains a need for empirical data (and modeling) of the seismic zones of critical influence given the design of the seismic array being used. It is recommended that directed studies of sound propagation and marine species’ reactions to seismic sounds be conducted in the waters of this Region.
- The oil spill models referenced in the SEA do not incorporate the new understandings of gas and oil behaviour and fate that resulted from the Macondo blowout in the Gulf of Mexico. Much of the relevant findings are now published and should be summarized in the SEA document and incorporated into any future modeling and planning exercises.

The risk, fate and effects of an oil spill or gas blowout under ice need to be analysed and summarized.

- The description of coastal habitats is very brief and their importance from the point of view of system productivity is not discussed. The only exception is kelp on the Quebec north shore which is outside the study area.

Most of the SEA information and analysis is compiled on a spatial scale that is suitable for offshore environments. The diversity and sensitivity of the coastal zone is not well captured at this scale. The SEA presents the results of coastal zone geomorphology and sensitivity studies of Cato (2011) but does not make any further use of them in the identification of habitats and areas of particular sensitivity from a fish and fish habitat perspective.

Eelgrass beds are recognized as sensitive habitat around the world. They are mentioned briefly in the SEA but their locations in the study area are not mapped or identified. Similarly, estuaries in the study area should be identified and the important fish species associated with them listed.

- Aquatic invasive species (AIS) are mentioned briefly in the report but the risks of introduction are not considered. This is a significant concern for the Western NL SEA as the study area includes coastal areas that are vulnerable to AIS introduction. Drilling platforms and rigs are often moored at a location for periods of time that allow them to pick up “hitchhikers” and then to unload those organisms or their propagules at the drilling location. Fouling communities on support vessels and barges are also a concern. Information on the NL Region AIS program can be found at www.nfl.dfo-mpo.gc.ca/AIS-EAE. The SEA should include a list of the species currently found in Newfoundland in other areas, particularly those where oil rigs and associated vessels may be moored for a period of time. A list of other potential invaders (e.g. those in other parts of the Gulf) should

also be included. Table 5.1 should include the risks of AIS introduction from vessels and platforms.

- Large numbers of studies of the response of the marine environment including fish and fish habitat to the Macondo oil spill are now published and available in the literature. These advances in our understanding of the consequences of oil and gas introductions into the marine environment should be summarized under fish and fish habitat response to oil spills.

Specific Comments by Section and/or Page Number

SECTION 2: OFFSHORE OIL AND GAS ACTIVITIES IN THE WESTERN NL OFFSHORE AREA AND SECTION 3: STRATEGIC ENVIRONMENTAL ASSESSMENT UPDATE: SCOPE, FOCUS AND APPROACH

Section 2.2.2.6 Potential Accidental Events and Malfunctions, and Section 3.4.4.2 Environmental Considerations and Possible Mitigation

Pages 33, 36, 64, etc... While the probability of a large-scale oil spill is low, operators off western NL will have to contend with ice for part of the year – not a factor in the recent Gulf oil spill. This should be discussed in light of what it would mean for spill propagation and the severe limitations for oil recovery efforts. The “worst case” might be a spill under ice, rather than a strong wind event.

SECTION 4: ENVIRONMENTAL SETTING

Section 4.1.1.5 Coastal Geomorphology

In this section there is a discussion of the Petroleum Vulnerability Index for the shoreline. The areas most vulnerable to an oil spill appear to be the mouths of our Atlantic Salmon Rivers (Table 4.1). These areas range from ratings of moderate to high to extreme in their sensitivity index. However, the connection between the sensitivity of these areas and the fact they are the mouths of Salmon rivers is not made. These areas would also be staging areas for smolt and adult Salmon. Most of the current drilling activity is occurring on-shore so it is likely that any spill would impact these near shore areas. There is no mention of the impact an oil spill would have on the returning adult Salmon's ability to home to its natal stream. It is suspected that this research has never been done.

The report does acknowledge that smolt migrate through the SEA area. However, recent research by Dempson showed that smolt can spend several weeks in the Conne River estuary. Therefore, the report may be underestimating the importance of estuaries to Salmon smolt as they leave their natal rivers.

In section 4 there is no mention of adult Atlantic Salmon migrating out of St. Georges Bay and in Figure 4.3.2 there appears to be no migration of adult Salmon within the boundaries of the SEA area.

The report's information on American Eel life history (Dutil 1989) is outdated. With reference to Table 4.35 (page 145) American Eel can and do take up permanent residency in estuaries. They burrow into the substrate and are found in estuaries during the winter.

Section 4.2.1.3 Benthos and Coastal Habitats

The following paper is critical in illustrating the relationship of Deep Sea Corals to fish larvae (particularly for the COSEWIC special concern Redfish species) and should be incorporated into SEA report.

Baillon, S., Hamel, J.F., Wareham, V.E., and Mercier, A. 2012. Deep cold-water corals as nurseries for fish larvae. *Frontiers in Ecology and the Environment* 10:351–356. <http://dx.doi.org/10.1890/120022>.

The following references will provide additional insight to the importance of Eelgrass and nearshore habitats, respectively:

DFO. 2009. Does eelgrass (*Zostera marina*) meet the criteria as an ecologically significant species? DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/018. http://www.dfo-mpo.gc.ca/CSAS/Csas/Publications/SAR-AS/2009/2009_018_e.pdf.

Cote, D., Gregory, R., Morris, C.J., Newton, B.H., and Schneider, D.C. 2013. Elevated habitat quality reduced variance in fish community composition. *Journal of Experimental Marine Biology and Ecology* 444:22-28. <http://dx.doi.org/10.1016/j.jembe.2012.11.006>.

The first paragraph on estuaries and their importance should be updated. The Corell (1978) reference is useful but dated. Recent work such as that of Greenlaw *et al.* (2011) might be more relevant.

Correll, D.L. 1978. Estuarine productivity. *BioScience*, 28, 646-650.

Greenlaw, M.E., Roff, J.C., Redden, A.M. and Allard, K.A. 2011. Coastal zone planning: a geophysical classification of inlets to define ecological representation. *Aquatic Conserv: Mar. Freshw. Ecosyst.*, 21: 448–461. doi: 10.1002/aqc.1200.

Section 4.2.1.4 Marine Fish (Invertebrate and Finfish Species)

On **page 143**, Table 4.34, pertaining to the section dedicated to Roughnose Grenadier (*Trachyrhynchus murrayi*), this species is uncommon but not rare in multispecies Research Vessel (RV) surveys conducted by DFO NL Region in Subarea 2+3. The current description is no longer adequate.

On **page 154**, Rainbow smelt are mentioned in the discussion of anadromous species but biological and ecological information is not included in Table 4.34.

Sea Trout populations occur in the study area but are not mentioned in the SEA. They should also be included in Table 4.34.

Figure 4.32 (**page 156**), does not show the movement of Atlantic Salmon back to natal rivers in the study area. There are a number of very important Salmon rivers in the study area and this information and the specific timing of the runs is available and should be included.

Referring to **page 157**, there is no evidence that Lobster populations on the coast of Newfoundland are regulated by river run-off. This may be relevant to areas in the Gulf that are significantly influenced by the productivity fluctuations determined by variation in the outflow from the St Lawrence River.

Aquatic invasive species are discussed on **pages 157-158**. This threat has not been acknowledged or further developed in section 5. Discussing the potential for the spread of aquatic invasives should be an important planning consideration.

Refer to the following reference for information on the potential impact of aquatic invasive species on NL environment due to ballast water exchange:

McKenzie, C.H., Han, G., He, M., Wells, T., and Maillet, G. 2011. *Alternate ballast exchange zones for the Newfoundland and Labrador Region – An aquatic invasive species risk assessment based on oceanographic modelling, ecologically and biologically significant areas and the sustainability of fisheries and aquaculture*. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/087. viii + 39 p.
http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/resdocs-docrech/2010/2010_087_e.pdf

Distribution maps would be informative for this SEA. Consult the following webpage for additional information and distributions of these organisms in the update area:

<http://www.nfl.dfo-mpo.gc.ca/AIS-EAE>

On **pages 167-179** (Figures 4.36 - 4.48), the number of tows for each year of RV survey data included on the maps of fish distribution and abundance would assist in the interpretation of these figures. If the number of tows is similar from year to year then a map of the tow locations would also be helpful.

Section 4.2.1.6 Fish Species at Risk

There is an inconsistency between the text in the third paragraph on **page 182** "There are currently four marine fish species..." and the accompanying Table 4.40. To avoid confusion, either keep the text and table consistent, or explain why the Banded Killifish has not been discussed as a Species at Risk (SAR) when it appears in the table under a species of concern (**page 183**). Table 4.40 is referenced throughout the text elsewhere without explanation of the exclusion of this species of concern. (Similar inconsistencies were noticed in section 4.2.3.6)

Section 4.2.3 Marine Mammals and Sea Turtles

The information that DFO and Memorial University of Newfoundland researchers have sighted Sperm Whales many times in shallow water, and close to the coastline in southern Newfoundland and occasionally in similar situations on the southwest and west coasts of Newfoundland should be added on **page 225**.

With reference to the information on **page 226**, the authors should note that a National Defense Reconnaissance aircraft recorded video of a group of more than 100 Beluga Whales swimming southwards near the coast off Port aux Port in the winter last year, so it is possible that Beluga Whales could be seen in this area during any time of year.

Section 4.3.6.3 Marine Protected Areas

On **page 259** the following point should be incorporated: Blue Whales are another Species at Risk that are found in the Laurentian Channel Area of Interest.

SECTION 5: ENVIRONMENTAL INTERACTIONS, MITIGATION AND KEY PLANNING CONSIDERATIONS

Section 5.1.2 Environmental Mitigation Measures

Page 273: Avoidance of sensitive areas or times is proposed in section 5.1.2 as mitigation for potential effects of oil and gas activities in the SEA. This presumes that sensitive areas have been identified before or during planning of operations. The SEA document has not done this at the scale that is relevant to the coastal zone except for referencing Catto's 2011 work. Sensitive areas of the coastal zone should be identified and any lacking information should be indicated in section 5.1.5 Information availability and requirements.

Catto, N.R. 2011. Coastal Erosion in Newfoundland. Newfoundland & Labrador Ministry of Environment and Conservation.

Section 5.3 Marine Mammals and Sea Turtles (including Species at Risk) and Section 5.4 Protected and Sensitive Areas

Sections 5.3.2 and 5.4.2 Environmental Mitigation Measures and Sections 5.3.3 and 5.4.3 Environmental Planning Considerations

With reference to **pages 292-294 and 297-298**, the mitigation measures listed in the SEA are far too generic and do not have much detail. There have been enough operations and associated recommendations to provide more detailed "minimum" practices, such as those described in the Federal Guide. If mitigations are warranted for proposed exploration activities in the Western NL area, they should be clearly identified and described in the SEA. This proactive approach would provide readers with a level of certainty regarding the nature and potential effects of oil and gas exploration activities in this area.

Section 5.3.2 Environmental Mitigation Measures

Page 293: Seismic operators should seek to provide dedicated and experienced personnel (not necessarily restricted to one individual) to act as marine mammal observers on board the seismic vessel. The use of Fisheries Liaison Officers (FLOs) or crewmembers to conduct monitoring is not appropriate as they are busy with other duties. Given the paucity of information regarding marine mammal abundance, distribution and reactions to seismic operations in the study area, using a dedicated and qualified marine mammal observer will provide both (1) a significant improvement in monitoring, and (2) reliable new information on marine mammals in this area. DFO encourages

the development of the best possible monitoring program that will produce and distribute important sighting data for marine mammals, and other marine species seen at or near the surface. Such monitoring should be conducted using a set of consensual guidelines with the object of providing the best possible data.

Section 5.1 Fish and Fish Habitat (including Species at Risk)

This section largely disregards potential inshore effects. As briefly discussed in **Section 2.2.2.3**, future development may incur onshore effects through horizontal drilling, increased traffic, mooring etc... Potential effects and mitigation and planning considerations for the inshore should be developed. As one example, in Table 5.1 under the 'Vessel Traffic' component, introduction and spread of aquatic invasive species and resulting habitat degradation should be included. See:

Morris, C.J., Gregory, R. S., Laurel, B.J., Methven, D.A., and Warren, M.A. 2011. Potential effect of eelgrass (*Zostera marina*) loss on nearshore Newfoundland fish communities, due to invasive green crab (*Carcinus maenas*). DFO Can. Sci. Advis. Sec. Res. Doc. 2010/140. iv + 17 p.
http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/resdocs-docrech/2010/2010_140_e.pdf

Figure 5.1 would be augmented with the inclusion of information about Eelgrass (ecologically significant species) distributions. See page 17 in:

Templeman, N.D. 2010. Ecosystem status and trends report for the Newfoundland and Labrador Shelf. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/026. vi + 72 p.
http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/resdocs-docrech/2010/2010_026_e.pdf

Section 5.1.3.1 Marine Fish Species at Risk

This section does not mention that American Eel which are designated as threatened will migrate through the Gulf as larval Eels (*leptocephali*) or Glass Eels (quite likely by the millions) in the spring and adults will migrate through the area in the fall.

Section 5.1.4 Cumulative Environmental Effects

The following statement is made in each of these sections (**pages 279-280**) for fish, birds and marine mammals (Note that in the quotation the text is bolded by the Science reviewer, not the SEA author, to emphasize the problematic statement): "...This anticipated level of exploration in the Western NL Offshore Area and the relatively short-term nature of these individual actions will likely mean that seismic surveys and drilling programs (and possibly, any development projects) will likely be separated enough in space and time that **cumulative effects are unlikely to occur.**" A similar statement is made on **page 288, Section 5.2.4** for marine birds.

The SEA is generally comprehensive and up to date in the presentation of information about Valued Environmental Components (VECs) within the area, their distribution and relative abundance (based on RV surveys). However, it is unclear how this statement can be made in the SEA without identifying the assessment methodology used to arrive at this conclusion. It is assumed that this ("...cumulative effects are unlikely to occur.") is a speculative statement and should be identified as such by the consultant.

As currently presented on **page 280**, statements including "...will *likely* be separated enough in space and time that cumulative effects are *unlikely* to occur" and "...these are therefore *unlikely* to overlap in space or time", are weak and unsubstantiated. These will want to be supported by specific mitigation options for EAs of any future developments.

Throughout **Section 5**, possible mitigation options and considerations are presented. With the exception of the final paragraph in **Section 5.5.2, page 305**, there is no discussion of options if mitigation measures are not successful. **Section 2.2.2.7** offers some options for compensation of personal monetary or goods losses, but it would be appropriate to discuss compensation options for environmental losses (e.g. Environmental Protection Plan (EPP)).

Science trusts that this review meets with your satisfaction and that these comments will be included the Departmental response to the C-NLOPB on the SEA Update report submitted by AMEC. Should you require any additional information on the above review please contact Dale Richards (dale.e.richards@dfo-mpo.gc.ca), Regional Centre for Science Advice, at 772-8892.

B. McCallum
Regional Director, Science

cc R. Anderson
C. Bourgeois
K. Clarke
G. Coughlan
K. Dalley
J. Lawson
A. Mansour
D. Power
L. Sheppard
D. Richards
G. Veinott

edr

Richards, Dale E

De: Carroll, Marlene
Envoyé: January-24-13 9:52 AM
À: Finn, Ray
Cc: Anderson, M. Robin; Bourgeois, Chuck; Clarke, Keith; Coughlan, Geoff; Dalley, Kate L;
Lawson, Jack; Mansour, Atef A H; Power, Don; Sheppard, Lee; Richards, Dale E; Veinott,
Geoff
Objet: Emailing: Western NL SEA update
Pièces jointes: Western NL SEA update.pdf

Attached is a copy of memo to Ray Finn from Regional Director Science re: Science review of Western Newfoundland and Labrador Offshore Area SEA Update.

Marlene Carroll
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Science Branch, NL Region
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Fisheries and Oceans
Canada

Pêches et Océans
Canada

MEMORANDUM

NOTE DE SERVICE

To
À
R. Finn
Regional Director Ecosystem Management

From
De
B. McCallum
Regional Director Science

Security Classification - Classification de sécurité Non classifié/Unclassified
Our File - Notre référence
Your File - Votre référence
Date January 16, 2013

Subject
Objet

Science review of Western Newfoundland and Labrador Offshore Area SEA Update

The Oceans Division of the Ecosystem Management Branch recently requested a Science review of the **Western Newfoundland and Labrador Offshore Area Strategic Environmental Assessment (SEA) Update Draft #1**. The following comments have been provided by Ecological Sciences, Groundfish, Marine Mammals, and Salmonids. The report is also being reviewed independently by Science in the Quebec Region.

General Comments

- Significant knowledge gaps exist in this study area and other areas around Newfoundland and Labrador. We again urge regulators to implement a class screening document for oil and gas exploration and production activities on the shelf regions of Newfoundland and Labrador that is complementary to the 1998 Scotian Shelf document. This must include a better discussion of sound propagation and biological impacts, especially given the known biological and physical differences between that area and the proposed project area.
- Every effort should be used to ensure that good observer data is collected – in particular the number of hours “on effort” to collect the marine mammal sightings data (which could be used to provide and estimate species density in the survey area). Do the future offshore development proponents intend to collect a similar level of information for these marine megafauna, it would be far more useful, but would require better observer training and more observer effort – neither of which is well-described in this document as requirements.
- Two or three seismic programs in the same area offer the risk of single and cumulative effects (i.e. there is a risk that a marine organism may be exposed to seismic sounds frequently, and potentially at levels high enough to cause displacement). Fisheries and Oceans Canada (DFO) agrees with the SEA authors that subsequent project-specific Environmental Assessment (EA) documents address this issue if multiple operations are planned.

- While it is likely that significant anthropogenic noise exists in the study area, site-specific measurements are not cited. As a precautionary approach, "pre-oil industry" sound measurements (and sound propagation measures) should be conducted to determine a baseline from which to compare future monitoring activities. Further, DFO strongly recommends that field measurements be conducted during any proposed seismic operations to verify the predictions of the model(s) used to conduct the assessment. Despite a number of published and "grey" literature studies, there remains a need for empirical data (and modeling) of the seismic zones of critical influence given the design of the seismic array being used. It is recommended that directed studies of sound propagation and marine species' reactions to seismic sounds be conducted in the waters of this Region.
- The oil spill models referenced in the SEA do not incorporate the new understandings of gas and oil behaviour and fate that resulted from the Macondo blowout in the Gulf of Mexico as well as the response of the marine environment including fish and fish habitat. Much of the relevant findings are now published and should be summarized in the SEA document and incorporated into any future modeling and planning exercises.
- The risk, fate and effects of an oil spill or gas blowout under ice need to be analysed and summarized.
- The description of coastal habitats is very brief and their importance from the point of view of system productivity is not discussed. The only exception is kelp on the Quebec north shore which is outside the study area.

Most of the SEA information and analysis is compiled on a spatial scale that is suitable for offshore environments. The diversity and sensitivity of the coastal zone is not well captured at this scale. The SEA presents the results of coastal zone geomorphology and sensitivity studies of Catto (2011) but does not make any further use of them in the identification of habitats and areas of particular sensitivity from a fish and fish habitat perspective.

Eelgrass beds are recognized as sensitive habitat around the world. They are mentioned briefly in the SEA but their locations in the study area are not mapped or identified. Similarly, estuaries in the study area should be identified and the important fish species associated with them listed.

- Aquatic invasive species (AIS) are mentioned briefly in the report but the risks of introduction are not considered. This is a significant concern for the Western NL SEA as the study area includes coastal areas that are vulnerable to AIS introduction. Drilling platforms and rigs are often moored at a location for periods of time that allow them to pick up "hitchhikers" and then to unload those organisms or their propagules at the drilling location. Fouling communities on support vessels and barges are also a concern. Information on the NL Region AIS program can be found at www.nfl.dfo-mpo.gc.ca/AIS-EAE. The SEA should include a list of the species currently found in Newfoundland in other areas, particularly those where oil rigs and associated vessels may be moored for a period of time. A list of other potential invaders (e.g. those in other parts of the Gulf) should

also be included. Table 5.1 should include the risks of AIS introduction from vessels and platforms.

Specific Comments by Section and/or Page Number

SECTION 2: OFFSHORE OIL AND GAS ACTIVITIES IN THE WESTERN NL OFFSHORE AREA AND SECTION 3: STRATEGIC ENVIRONMENTAL ASSESSMENT UPDATE: SCOPE, FOCUS AND APPROACH

Section 2.2.2.6 Potential Accidental Events and Malfunctions, and Section 3.4.4.2 Environmental Considerations and Possible Mitigation

Pages 33, 36, 64, etc... While the probability of a large-scale oil spill is low, operators off western NL will have to contend with ice for part of the year – not a factor in the recent Gulf oil spill. This should be discussed in light of what it would mean for spill propagation and the severe limitations for oil recovery efforts. The “worst case” might be a spill under ice, rather than a strong wind event.

SECTION 4: ENVIRONMENTAL SETTING

Section 4.1.1.5 Coastal Geomorphology

In this section there is a discussion of the Petroleum Vulnerability Index for the shoreline. The areas most vulnerable to an oil spill appear to be the mouths of our Atlantic Salmon Rivers (Table 4.1). These areas range from ratings of moderate to high to extreme in their sensitivity index. However, the connection between the sensitivity of these areas and the fact they are the mouths of Salmon rivers is not made. These areas would also be staging areas for smolt and adult Salmon. Most of the current drilling activity is occurring on-shore so it is likely that any spill would impact these near shore areas. There is no mention of the impact an oil spill would have on the returning adult Salmon's ability to home to its natal stream. It is suspected that this research has never been done.

The report does acknowledge that smolt migrate through the SEA area. However, recent research by Dempson et al. (2011) showed that smolt can spend several weeks in the Conne River estuary. Therefore, the report may be underestimating the importance of estuaries to Salmon smolt as they leave their natal rivers.

In Section 4 there is no mention of adult Atlantic Salmon migrating out of St. Georges Bay and in Figure 4.3.2 there appears to be no migration of adult Salmon within the boundaries of the SEA area.

The report's information on American Eel life history (Dutil 1989) is outdated. With reference to Table 4.35 (**page 145**) American Eel can and do take up permanent residency in estuaries. They burrow into the substrate and are found in estuaries during the winter.

Section 4.2.1.3 Benthos and Coastal Habitats

The following paper is critical in illustrating the relationship of Deep Sea Corals to fish larvae (particularly for the COSEWIC special concern Redfish species) and should be incorporated into SEA report.

Baillon, S., Hamel, J.F., Wareham, V.E., and Mercier, A. 2012. Deep cold-water corals as nurseries for fish larvae. *Frontiers in Ecology and the Environment* 10: 351-356. <http://dx.doi.org/10.1890/120022>.

The following references will provide additional insight to the importance of Eelgrass and nearshore habitats, respectively:

DFO. 2009. Does eelgrass (*Zostera marina*) meet the criteria as an ecologically significant species? DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/018. http://www.dfo-mpo.gc.ca/CSAS/Csas/Publications/SAR-AS/2009/2009_018_e.pdf.

Cote, D., Gregory, R., Morris, C.J., Newton, B.H., and Schneider, D.C. 2013. Elevated habitat quality reduced variance in fish community composition. *J. Exp. Mar. Biol. Ecol.* 444: 22-28. <http://dx.doi.org/10.1016/j.jembe.2012.11.006>.

The first paragraph on estuaries and their importance should be updated. The Corell (1978) reference is useful but dated. Recent work such as that of Greenlaw et al. (2011) might be more relevant.

Correll, D.L. 1978. Estuarine productivity. *BioScience* 28: 646-650.

Greenlaw, M.E., Roff, J.C., Redden, A.M. and Allard, K.A. 2011. Coastal zone planning: a geophysical classification of inlets to define ecological representation. *Aquatic Conserv: Mar. Freshw. Ecosyst.*, 21: 448-461. doi: 10.1002/aqc.1200.

Section 4.2.1.4 Marine Fish (Invertebrate and Finfish Species)

On **page 143**, Table 4.34, pertaining to the section dedicated to Roughnose Grenadier (*Trachyrhynchus murrayi*), this species is uncommon but not rare in multispecies Research Vessel (RV) surveys conducted by DFO NL Region in Subarea 2+3. The current description is no longer adequate.

On **page 154**, Rainbow smelt are mentioned in the discussion of anadromous species but biological and ecological information is not included in Table 4.34.

Sea Trout populations occur in the study area but are not mentioned in the SEA. They should also be included in Table 4.34.

Figure 4.32 (**page 156**), does not show the movement of Atlantic Salmon back to natal rivers in the study area. There are a number of very important Salmon rivers in the study area and this information and the specific timing of the runs is available and should be included.

Referring to **page 157**, there is no evidence that Lobster populations on the coast of Newfoundland are regulated by river run-off. This may be relevant to areas in the Gulf that are significantly influenced by the productivity fluctuations determined by variation in the outflow from the St Lawrence River.

Aquatic invasive species are discussed on **pages 157-158**. This threat has not been acknowledged or further developed in Section 5. Discussing the potential for the spread of aquatic invasives should be an important planning consideration.

Refer to the following reference for information on the potential impact of aquatic invasive species on NL environment due to ballast water exchange:

McKenzie, C.H., Han, G., He, M., Wells, T., and Maillet, G. 2011. Alternate ballast exchange zones for the Newfoundland and Labrador Region – An aquatic invasive species risk assessment based on oceanographic modelling, ecologically and biologically significant areas and the sustainability of fisheries and aquaculture. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/087. viii + 39 p.
http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/resdocs-docrech/2010/2010_087_e.pdf

Distribution maps would be informative for this SEA. Consult the following webpage for additional information and distributions of these organisms in the update area:

<http://www.nfl.dfo-mpo.gc.ca/AIS-EAE>

On **pages 167-179** (Figures 4.36-4.48), the number of tows for each year of RV survey data included on the maps of fish distribution and abundance would assist in the interpretation of these figures. If the number of tows is similar from year to year then a map of the tow locations would also be helpful.

Section 4.2.1.6 Fish Species at Risk

There is an inconsistency between the text in the third paragraph on **page 182** "There are currently four marine fish species..." and the accompanying Table 4.40. To avoid confusion, either keep the text and table consistent, or explain why the Banded Killifish has not been discussed as a Species at Risk (SAR) when it appears in the table under a species of concern (**page 183**). Table 4.40 is referenced throughout the text elsewhere without explanation of the exclusion of this species of concern. (Similar inconsistencies were noticed in Section 4.2.3.6)

Section 4.2.3 Marine Mammals and Sea Turtles

The information that DFO and Memorial University of Newfoundland (MUN) researchers have sighted Sperm Whales many times in shallow water, and close to the coastline in southern Newfoundland and occasionally in similar situations on the southwest and west coasts of Newfoundland should be added on **page 225**.

With reference to the information on **page 226**, the authors should note that a National Defense Reconnaissance aircraft recorded video of a group of more than 100 Beluga Whales swimming

southwards near the coast off Port aux Port in the winter last year, so it is possible that Beluga Whales could be seen in this area during any time of year.

Section 4.3.6.3 Marine Protected Areas

On **page 259** the following point should be incorporated: Blue Whales are another Species at Risk that are found in the Laurentian Channel Area of Interest.

SECTION 5: ENVIRONMENTAL INTERACTIONS, MITIGATION AND KEY PLANNING CONSIDERATIONS

Section 5.1.2 Environmental Mitigation Measures

Page 273: Avoidance of sensitive areas or times are proposed in Section 5.1.2 as mitigation for potential effects of oil and gas activities in the SEA. This presumes that sensitive areas have been identified before or during planning of operations. The SEA document has not done this at the scale that is relevant to the coastal zone except for referencing Catto's 2011 work. Sensitive areas of the coastal zone should be identified and any lacking information should be indicated in Section 5.1.5 Information availability and requirements.

Catto, N.R. 2011. Coastal Erosion in Newfoundland. Newfoundland & Labrador Ministry of Environment and Conservation.

Section 5.3 Marine Mammals and Sea Turtles (including Species at Risk) and Section 5.4 Protected and Sensitive Areas

Sections 5.3.2 and 5.4.2 Environmental Mitigation Measures and Sections 5.3.3 and 5.4.3 Environmental Planning Considerations

With reference to **pages 292-294 and 297-298**, the mitigation measures listed in the SEA are far too generic and do not have much detail. There have been enough operations and associated recommendations to provide more detailed "minimum" practices, such as those described in the Federal Guide. If mitigations are warranted for proposed exploration activities in the Western NL area, they should be clearly identified and described in the SEA. This proactive approach would provide readers with a level of certainty regarding the nature and potential effects of oil and gas exploration activities in this area.

Section 5.3.2 Environmental Mitigation Measures

Page 293: Seismic operators should seek to provide dedicated and experienced personnel (not necessarily restricted to one individual) to act as marine mammal observers on board the seismic vessel. The use of Fisheries Liaison Officers (FLOs) or crewmembers to conduct monitoring is not appropriate as they are busy with other duties. Given the paucity of information regarding marine mammal abundance, distribution and reactions to seismic operations in the study area, using a dedicated and qualified marine mammal observer will provide both (1) a significant improvement in monitoring, and (2) reliable new information on marine mammals in this area. DFO encourages the development of the best possible monitoring program that will produce and distribute important sighting data for marine mammals, and other marine species seen at or near the surface. Such

monitoring should be conducted using a set of consensual guidelines with the object of providing the best possible data.

Section 5.1 Fish and Fish Habitat (including Species at Risk)

This section largely disregards potential inshore effects. As briefly discussed in **Section 2.2.2.3**, future development may incur onshore effects through horizontal drilling, increased traffic, mooring etc... Potential effects and mitigation and planning considerations for the inshore should be developed. As one example, in Table 5.1 under the 'Vessel Traffic' component, introduction and spread of aquatic invasive species and resulting habitat degradation should be included. See:

Morris, C.J., Gregory, R. S., Laurel, B.J., Methven, D.A., and Warren, M.A. 2011. Potential effect of eelgrass (Zostera marina) loss on nearshore Newfoundland fish communities, due to invasive green crab (Carcinus maenas). DFO Can. Sci. Advis. Sec. Res. Doc. 2010/140. iv + 17 p.
http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/resdocs-docrech/2010/2010_140_e.pdf

Figure 5.1 would be augmented with the inclusion of information about Eelgrass (ecologically significant species) distributions. See page 17 in the following:

Templeman, N.D. 2010. Ecosystem status and trends report for the Newfoundland and Labrador Shelf. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/026. vi + 72 p.
http://www.dfo-mpo.gc.ca/CSAS/Csas/publications/resdocs-docrech/2010/2010_026_e.pdf

Section 5.1.3.1 Marine Fish Species at Risk

This section does not mention that American Eel which are designated as threatened will migrate through the Gulf as larval Eels (*leptocephali*) or Glass Eels (quite likely by the millions) in the spring and adults will migrate through the area in the fall.

Section 5.1.4 Cumulative Environmental Effects

The following statement is made in each of these sections (**pages 279-280**) for fish, birds and marine mammals (Note that in the quotation the text is bolded by the Science reviewer, not the SEA author, to emphasize the problematic statement): "...This anticipated level of exploration in the Western NL Offshore Area and the relatively short-term nature of these individual actions will likely mean that seismic surveys and drilling programs (and possibly, any development projects) will likely be separated enough in space and time that **cumulative effects are unlikely to occur.**" A similar statement is made on **page 288, Section 5.2.4** for marine birds.

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- 8 -

As currently presented on **page 280**, statements including "...will *likely* be separated enough in space and time that cumulative effects are *unlikely* to occur" and "...these are therefore *unlikely* to overlap in space or time", are weak and unsubstantiated. These need to be supported by specific mitigation options for EAs of any future developments.

Throughout **Section 5**, possible mitigation options and considerations are presented. With the exception of the final paragraph in **Section 5.5.2, page 305**, there is no discussion of options if mitigation measures are not successful. **Section 2.2.2.7** offers some options for compensation of personal monetary or goods losses, but it would be appropriate to discuss compensation options for environmental losses (e.g. Environmental Protection Plan (EPP)).

Should you require any additional information on the above review please contact Dale Richards (dale.e.richards@dfo-mpo.gc.ca), Regional Centre for Science Advice, at 772-8892.



B. McCallum
Regional Director, Science

cc R. Anderson
C. Bourgeois
K. Clarke
G. Coughlan
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J. Lawson
A. Mansour
D. Power
L. Sheppard
D. Richards
G. Veinott

edr

Richards, Dale E

De: Lawson, Jack
Envoyé: January-24-13 10:58 AM
À: Richards, Dale E; Coughlan, Geoff
Cc: Sheppard, Lee
Objet: RE: Clarification on a Science SEA comment
Pièces jointes: DFO 2007 Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment - Background Paper.pdf; DFO 2007 Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment.pdf

Good morning,

The "minimum" practices are described in the 2007 DFO documents (attached) called: "Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment". These guidelines need additional review, in my opinion, given their age and the publication of new studies over time, but they at least indicate the Department's concerns and suggested strategies to address these.

regards, Jack

Dr. Jack Lawson
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jack.lawson@dfo-mpo.gc.ca

From: Richards, Dale E
Sent: January 23, 2013 2:51 PM
To: Coughlan, Geoff
Cc: Sheppard, Lee; Lawson, Jack
Subject: RE: Clarification on a Science SEA comment

s.19(1)

Hi Geoff,

The comment was submitted by Jack Lawson. [REDACTED] if you could contact Jack (copied on this message) you would most likely get your question resolved quicker. I am assuming that Jack is in the office?

Hope that this helps,
Dale (Ottawa until Friday)

From: Coughlan, Geoff
Sent: Wed 23/01/2013 11:25 AM
To: Richards, Dale E
Subject: Clarification on a Science SEA comment

Hi Dale,

On p. 6 of the submitted comments it states *"There have been enough operations and associated recommendations to provide more detailed "minimum" practices, such as those described in the Federal Guide"*.

Can you get clarification on what Federal Guide is being referred to please (title)?

Geoff

Geoff Coughlan (MEDes)

-

Oceans Division/Division des Océans

Ecosystems Management Branch / Gestions des écosystèmes

Fisheries and Oceans Canada / Pêches et Océans Canada

Newfoundland and Labrador Region / Région de Terre-Neuve-et-Labrador

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Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment

Background Paper

2007

Summary

Recent years have seen a heightened interest in the potential impacts of seismic surveying on the marine environment. In 2004, federal and provincial government advisors, and national and international scientific experts met to review the body of scientific knowledge that exists in this area. A review of the most effective and appropriate mitigative measures used world-wide was also conducted. These reviews led to the identification of a set of mitigation measures, which can assist in minimizing the potential adverse impacts of marine seismic activity. Federal and provincial governments have compiled these mitigation measures into the *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment*. The *Statement* sets out minimum standards which will apply in Canada's non-ice covered marine waters to all seismic activities that use air source arrays. It will complement the existing environmental assessment processes, including those pursuant to settled land claims, and the existing regulatory requirements that currently govern marine seismic activities. Recognizing that the body of scientific knowledge is continually expanding, the *Statement* will be regularly reviewed. As new scientific information and improved mitigation technologies and practices emerge, these will be considered for incorporation into the *Statement*.

SOUND IN THE OCEANS is generated by a variety of natural sources, including vocalisation by marine life as well as wind and wave action, ice movements, and meteorological and oceanographic conditions.

Human activity also contributes to sound in the marine environment. Activities such as navigation, dredging, pile driving, ice breaking, whale watching and operating fishing gear each produce sound patterns with distinct characteristics. Resource exploration and production activities, including offshore drilling and marine seismic surveying, produce different types of sound. Active sonar which is used by security and defence operations produces a distinct type of sound.

There are fundamental differences between the type and intensity of sound generated by seismic air source arrays and sound associated with active sonar. These differences are mainly due to the emission of sounds of different intensity, frequency and direction of transmission.

Oceanographic characteristics such as the physiography of the sea bottom, the water depth, temperature, salinity and density differences can influence the transmission of sound as it travels through water. For example, sound levels are quickly reduced in shallow waters. In deeper waters, sound is likely to propagate further, especially where acoustic channels exist to conduct and focus sound energy.

In recent years, considerable international effort has been dedicated to a better understanding of the generation and transmission of sound in the marine environment and of the potential impacts of marine sound on life in the oceans. One area that has been of

particular interest to the Canadian public is the sound associated with conducting marine seismic surveys.

SEISMIC SURVEYS use sound waves to gather information about geological structures lying beneath the surface of the earth, both on land and in the marine environment. A common purpose for conducting seismic surveys is to locate rock formations that could potentially contain hydrocarbons. Seismic surveys are also conducted by government and academic researchers for general scientific purposes, to understand the composition, structure and movement of the earth's crust.

During marine seismic surveys, compressed air is released into the water column, creating a sound energy pulse. The pulse is "focused" to concentrate the sound energy toward the ocean bottom rather than horizontally. These surveys are carried out from a ship that tows a sound source or sources, referred to as "air source arrays", and one or more cables ("streamers") that contain sound receivers and other instruments.

The sea floor and the structures beneath it are mapped by measuring the time it takes for a sound energy pulse to leave the source, penetrate the earth, reflect off a subsurface layer, and return to a sound receiver. Reflections occur at each layer where there is a measurable change in the speed at which sound is transmitted. The data retrieved from these surveys provides information on depth, position and shape of underground geological formations.

Most seismic surveys conducted in Canadian marine waters fall into the category of two-dimensional (2D) surveys or three-dimensional (3D) surveys. The objective of a 2D survey is to provide a broad picture of the geological characteristics of an area, including type and size of structures present. In conducting a 2D survey, a seismic vessel typically tows a single air source array and a single set of receivers along a set of parallel and transverse lines, spaced up to five kilometres apart, to create a grid pattern. A 3D seismic survey is conducted over a smaller area, to obtain more detailed geological information and to identify potential targets for hydrocarbon drilling. 3D surveys also create a grid pattern, but generally use two or more air source arrays and multiple sets of receivers trailed closer together.

THE POTENTIAL IMPACTS OF SEISMIC SOUND ON MARINE LIFE have been studied internationally for decades. Biological impacts on marine life from seismic surveys are generally discussed in terms of:

- physical impacts, or changes in organisms' physical state;
- physiological impacts, or changes in biological functions; and
- behavioural impacts, or changes in how organisms act.

In 2004, governments and academic researchers set out to take stock of our scientific knowledge in these areas. The process, which was led by Fisheries and Oceans Canada, culminated in a scientific peer review process involving national and international scientific experts. It considered the most current evidence of physical and physiological impacts of seismic sound on marine life, as well as potential behavioural impacts, and

whether those impacts were direct, indirect, chronic or cumulative. The peer review process drew a number of conclusions using a risk-based approach that considered the likelihood of occurrence, the frequency and duration of the impact and the ecological significance or severity of the impact.¹

In general, studies have found that for key components of the ecosystem, including invertebrates, fish, marine mammals and sea turtles, biological impacts vary from species to species and according to the proximity to the sound source arrays. Impacts are greatest within a few metres of the seismic source arrays.

Some marine mammals rely heavily on the use of underwater sounds to communicate and to echo-locate and emit and can sense different sound frequencies. There is evidence that these species hear and react to many man-made sounds including those associated with seismic surveys. The available data suggests that for a seismic sound to result in auditory impairment or other direct physical impacts for marine mammals, animals must be located within a short distance from the sound source. Most marine mammals, including most baleen whales, some odontocetes (toothed whales) and some pinnipeds (seals), generally avoid the immediate vicinity of active seismic vessels. However, some marine mammals, such as dolphins and porpoises, have been observed to swim near sources of seismic sound, with no apparent impacts.

The findings of the peer review process concluded that there was evidence that at certain received sound levels, behavioural changes can be manifested by some marine fish, marine mammals and sea turtles. If seismic surveys were to occur in areas and at times when a large enough aggregation of these marine organisms were engaged in critical biological functions the behavioural impacts might have important ecological and population-level impacts. For example the impact may be important if it results in the displacement of breeding, feeding or nursing marine mammals, dispersion of spawning aggregations of fish in their spawning areas and diversion of aggregations of marine mammals and fish from their migration routes.

While there has recently been an increased interest in sea turtles because of the endangered or threatened status of some species, relatively little is known about the sensitivity of these species to sound. Studies do indicate that sea turtles are able to detect sound frequencies similar to those generated during seismic surveys. As a measure of precaution, given the limited knowledge on the sensitivity of sea turtles to sound and given the endangered status of a number of sea turtles, it was concluded that sea turtles should have the benefit of the same mitigative measures as marine mammals.

Building on existing scientific information, the peer review process concluded that mitigation should be used where detrimental population-scale impacts were considered likely to occur, or where adverse impacts including death, harm or harassment of

¹ The report of the peer review, *Review of Scientific Information on Impacts of Seismic Sound on Fish, Invertebrates, Marine Turtles and Marine Mammals* (Habitat Status Report 2004/002), is available online at: http://www.dfo-mpo.gc.ca/csas/Csas/status/2004/HSR2004_002_E.pdf

individual marine mammals or turtles listed as endangered or threatened on Schedule 1 of the *Species at Risk Act* were likely to occur.

The peer review process identified a number of recognized measures for mitigating the potential impacts of seismic sound, consistent with a precautionary approach. A federal-provincial regulatory policy review further identified the most effective measures which would be appropriate for use in Canadian marine waters. Federal and provincial governments have agreed to incorporate these measures into the *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment*.

The *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment* specifies the mitigation requirements that must be met during the planning and conduct of marine seismic surveys, in order to minimize impacts on life in the oceans. These requirements are set out as minimum standards, which will apply in all non-ice covered marine waters in Canada. The *Statement* complements existing environmental assessment processes, including those set out in settled land claims. The current regulatory system will continue to address protection of the health and safety of offshore workers and ensure that seismic activities are respectful of interactions with other ocean users.

The *Statement* was developed by federal and provincial authorities responsible for the regulation and management of seismic surveys, including representatives from the provincial governments of Nova Scotia, Newfoundland and Labrador, British Columbia and Quebec. Federally, representation included Natural Resources Canada, Indian and Northern Affairs Canada, and Fisheries and Oceans Canada. The *Statement* was developed following a peer review process involving scientific and technical experts, acousticians, and experts in the design and effectiveness of mitigative measures. Public policy experts as well as experts from the National Energy Board, the Canada-Nova Scotia and the Canada-Newfoundland and Labrador Offshore Petroleum Boards were also consulted. Public input on the *Statement* was received during a 60-day web-based public consultation, and targeted discussions were held with representatives from the fishing and oil and gas sectors, academics and other interested parties.

The *Statement* will apply to all seismic activities in the marine environment that use air source arrays; as such it will not apply to activities conducted in ice covered waters. For seismic surveys conducted for the purpose of oil and gas exploration, the *Statement* will be administered by the existing oil and gas regulatory bodies – the National Energy Board, the Canada-Nova Scotia Offshore Petroleum Board, and the Canada-Newfoundland and Labrador Offshore Petroleum Board. For seismic surveys conducted for any other purposes, the *Statement* will be administered by Fisheries and Oceans Canada.

The *Statement* was drafted using the best available scientific information, current international best management practices and internationally recognized techniques to mitigate the impacts of seismic sound in the marine environment. However, it is recognized that the body of scientific knowledge is continually expanding. As new

scientific information and improved mitigation technologies and practices emerge, these will be considered for incorporation into the *Statement*. The *Statement* will be reviewed on an annual basis, and interested parties will be consulted on any potential amendments.

The *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment* sets out mitigation requirements for:

- Planning of seismic surveys;
- Establishment and monitoring of a safety zone;
- Prescribed marine mammal observation and detection measures.
- Prescribed start-up; and
- Prescribed shut-down.

The following sections briefly describe each of these areas, and the requirements contained in the *Statement*:

Planning of seismic surveys

The *Statement* requires that operators plan and design seismic survey programs according to certain conditions. As a precautionary measure and to minimize the unnecessary introduction of sound into the marine environment, surveys are to be designed to use the minimum energy needed to obtain the information sought, to reduce or baffle the horizontal spread of sound and reduce the generation of unnecessary high frequency sounds.

In order to further reduce the potential impacts of a seismic survey, there is an additional requirement to design programs which avoid areas where it is known that there are aggregations of marine mammals and marine fish at critical times in their life cycle and during critical biological functions such as spawning, breeding, feeding, nursing and migration times.

Establishment and monitoring of a safety zone

Recognizing that sound is most intense closest to the air source and that the potential impacts of seismic are greatest within short distances, the *Statement* requires that a "safety zone" be established and monitored around seismic air source arrays. As noted above, the propagation of sound and of specific frequencies varies according to many factors, including ocean depths, temperatures and salinity. This poses a challenge in establishing precise distance at which specific sound levels can be expected. Similarly, marine species respond differently to various frequencies of sound, depending on their biological characteristics, life history and their respective hearing thresholds. The use and testing of sound propagation models combined with active science research programs are increasing our understanding of potential impacts and relationships between sound levels/distance and those impacts.

The *Statement* contains a basic requirement for a minimum 500m safety zone, established around the air source array(s). Existing scientific evidence and the application of a

precautionary approach revealed that beyond a 500m safety zone, sound energy from seismic activity is unlikely to cause adverse impacts on marine mammals and sea turtles, under many circumstances. However, the *Statement* recognizes that in other circumstances, environmental assessment processes may identify the need for a safety zone of greater than 500m.

As is discussed below, the *Statement* requires seismic vessels to use a qualified marine mammal observer to watch the safety zone. If a whale, dolphin, porpoise or sea turtle is seen by a marine mammal observer to be within the safety zone, the air source array must not be started up until the area is clear. Similarly if a marine mammal listed as endangered or threatened in Schedule 1 of the *Species at Risk Act* is in the area of the safety zone, no activity can begin.

Prescribed start-up

Most marine species will likely avoid a seismic vessel while survey activities are underway. Seismic operators are required to take advantage of this behaviour by using a start up technique whereby activation of the air source arrays begins with a pulse from the lowest energy source on the array. The remainder of the sound sources on the array are gradually activated over a fixed period of time. This procedure provides the time and the incentive for marine mammals and fish to leave the immediate area.

In certain circumstances, such as well site surveys and vertical seismic profiling, only one energy source is used. In this circumstance, where technically feasible, the start-up procedure should consist of a gradual increase of the intensity of the sound until it reaches the required intensity.

Prescribed shut-down

Once seismic survey activity is ongoing, if a marine mammal or a turtle listed as endangered or threatened on Schedule 1 of the *Species at Risk Act* enters the safety zone the operator must shut down and wait for them to leave. The *Statement* also requires shut down of the array if other marine mammals or sea turtles enter the safety zone. These species could be those identified by an environmental review process as possibly experiencing significantly-adverse population-level impacts if exposed to seismic sound.

Prescribed procedures when active surveying ceases

As a precautionary measure and to reduce the amount of unnecessary sound released into the marine environment, when active surveying ceases, operators are required to either shut down the energy source completely or shut down all but one source. Continued release of sound from a single source would serve to deter whale, dolphin, porpoises or turtles from entering the safety zone.

Prescribed marine mammal observation and detection measures

Marine mammal observer: The *Statement* requires the stationing of a qualified marine mammal observer on board seismic vessels. The marine mammal observer is required to verify that the safety zone is clear for at least 30 minutes before the seismic air source array (s) can be activated. A marine mammal observer is required to maintain a regular watch during the entire duration of the time that the air source arrays are active and that the safety zone is visible.

Use of Cetacean detection technology: Reduced visibility and storm conditions may require the use of different mitigative measures, such as Passive Acoustic Monitoring, to detect and track the sounds made by vocalizing marine mammals prior to start-up. Passive Acoustic Monitoring uses “listening” technology to detect animals that are below the sea surface, while having no adverse environmental impacts of its own. Passive Acoustic Monitoring’s usefulness presently is limited to those species that are known to vocalize and to spend much time below the water surface (e.g., dolphins, sperm whales, northern bottlenose whales). Additional approaches to marine mammal detection (including radar, infrared detection and adaptation of fishing industry “fish finder” technologies) are currently in the research and planning stages, and will likely be available in upcoming years.

The *Statement* requires the use of cetacean detection technology under certain circumstances and conditions. If all of the following conditions exist, then PAM, or equivalent technology, must be used:

- the survey’s sound sources array has been shut down for more than 30 minutes;
- the full extent of the safety zone is not visible;
- the survey is in an area where vocalizing cetaceans such as dolphins, porpoises and whales listed as endangered or threatened in Schedule 1 of the *Species at Risk Act* are likely to be encountered, or if the survey is conducted in an area where species identified in an environmental assessment process as likely to be negatively impacted at a population level by seismic sound are likely to be found.

Under these conditions, if the presence of a vocalizing whale, porpoise or dolphin is detected and it cannot be identified, the operator must assume that it is a whale listed as endangered or threatened in Schedule 1 of the *Species at Risk Act*, or one identified by an environmental assessment process, and the operation must shut down and remain shut down until the operator is able to determine that the whale, dolphin or porpoise is outside the safety zone, or has not been heard for at least 30 minutes.

Additional or modified mitigative measures

In some cases, environmental assessment processes will point to regional specificities, including oceanographic, geomorphologic and biological characteristics, and regulatory reviews may require modified or additional mitigative measures to be applied. Also, variations to the mitigative measures set out in the *Statement* may be allowed if persons

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wishing to conduct seismic surveys provide an equivalent or greater level of environmental protection.

Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment

Context

The Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment specifies the mitigation requirements that must be met during the planning and conduct of marine seismic surveys, in order to minimize impacts on life in the oceans. These requirements are set out as minimum standards, which will apply in all non-ice covered marine waters in Canada. The *Statement* complements existing environmental assessment processes, including those set out in settled land claims. The current regulatory system will continue to address protection of the health and safety of offshore workers and ensure that seismic activities are respectful of interactions with other ocean users.

Definitions

Cetacean: means a whale, dolphin or porpoise.

Critical habitat: means the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species.

Marine Mammal Observer: means an individual trained to identify different species of marine mammals and turtles that may reasonably be expected to be present in the area where the seismic survey will take place.

Marine mammals: means all cetaceans and pinnipeds.

Passive Acoustic Monitoring: means a technology that may be used to detect the subsea presence of vocalizing cetaceans.

Pinniped: means a seal, sea lion or walrus.

Ramp-up: means the gradual increase in emitted sound levels from a seismic air source array by systematically turning on the full complement of an array's air sources over a period of time.

Seismic air source: means an air source that is used to generate acoustic waves in a seismic survey.

Seismic air source array(s): means one or a series of devices designed to release compressed air into the water column in order to create an acoustical energy pulse to penetrate the seafloor.

Seismic survey: means a geophysical operation that uses a seismic air source to generate acoustic waves that propagate through the earth, are reflected from or refracted along subsurface layers of the earth, and are subsequently recorded.

"Statement:" means the Statement of Canadian Practice for the Mitigation of Seismic Sound in the Marine Environment.

Whale: means a cetacean that is not a dolphin or porpoise.

Application

1. Unless otherwise provided, the mitigation measures set out in this Statement apply to all seismic surveys planned to be conducted in Canadian marine waters and which propose to use an air source array(s).
2. The mitigation measures set out in this Statement do not apply to seismic surveys conducted:
 - a. on ice-covered marine waters; or
 - b. in lakes or the non-estuarine portions of rivers.

Planning Seismic Surveys

Mitigation Measures

3. Each seismic survey must be planned to
 - a. use the minimum amount of energy necessary to achieve operational objectives;
 - b. minimize the proportion of the energy that propagates horizontally; and
 - c. minimize the amount of energy at frequencies above those necessary for the purpose of the survey.
4. All seismic surveys must be planned to avoid:
 - a. a significant adverse effect for an individual marine mammal or sea turtle of a species listed as endangered or threatened on Schedule 1 of the *Species at Risk Act*; and
 - b. a significant adverse population-level effect for any other marine species.
5. Each seismic survey must be planned to avoid:
 - a. displacing an individual marine mammal or sea turtle of a species listed as endangered or threatened on Schedule 1 of the *Species at Risk Act* from breeding, feeding or nursing;
 - b. diverting an individual migrating marine mammal or sea turtle of a species listed as endangered or threatened on Schedule 1 of the *Species at Risk Act* from a known migration route or corridor;
 - c. dispersing aggregations of spawning fish from a known spawning area;
 - d. displacing a group of breeding, feeding or nursing marine mammals, if it is known there are no alternate areas available to those marine mammals for those activities, or that if by using those alternate areas, those marine mammals would incur significant adverse effects; and
 - e. diverting aggregations of fish or groups of marine mammals from known migration routes or corridors if it is known there are no alternate migration routes or corridors, or that if by using those alternate migration routes or corridors, the group of marine mammals or aggregations of fish would incur significant adverse effects.

Safety Zone and Start-up

Mitigation Measures

6. Each seismic survey must:
 - a. establish a safety zone which is a circle with a radius of at least 500 metres as measured from the centre of the air source array(s); and
 - b. for all times the safety zone is visible,
 - i. a qualified Marine Mammal Observer must continuously observe the safety zone for a minimum period of 30 minutes prior to the start up of the air source array(s), and
 - ii. maintain a regular watch of the safety zone at all other times if the proposed seismic survey is of a power that it would meet a threshold requirement for an assessment under the *Canadian Environmental Assessment Act*, regardless of whether the Act applies.
7. If the full extent of the safety zone is visible, before starting or restarting an air source array(s) after they have been shut-down for more than 30 minutes, the following conditions and processes apply:
 - a. none of the following have been observed by the Marine Mammal Observer within the safety zone for at least 30 minutes:
 - i. a cetacean or sea turtle,
 - ii. a marine mammal listed as endangered or threatened on Schedule 1 of the *Species at Risk Act*, or
 - iii. based on the considerations set out in sub-section 4(b), any other marine mammal that has been identified in an environmental assessment process as a species for which there could be significant adverse effects; and
 - b. a gradual ramp-up of the air source array(s) over a minimum of a 20 minute period beginning with the activation of a single source element of the air source array(s), preferably the smallest source element in terms of energy output and a gradual activation of additional source elements of the air source array(s) until the operating level is obtained.

Shut-down of Air Source Array(s)

Mitigation Measures

8. The air source array(s) must be shut down immediately if any of the following is observed by the Marine Mammal Observer in the safety zone:
 - a. a marine mammal or sea turtle listed as endangered or threatened on Schedule 1 of the *Species at Risk Act*; or
 - b. based on the considerations set out in sub-section 4(b), any other marine mammal or sea turtle that has been identified in an environmental assessment process as a species for which there could be significant adverse effects.

Line Changes and Maintenance Shut-downs

Mitigation Measures

9. When seismic surveying (data collection) ceases during line changes, for maintenance or for other operational reasons, the air source array(s) must be:
 - a. shut down completely; or
 - b. reduced to a single source element.
10. If the air source array(s) is reduced to a single source element as per subsection 9(b), then:
 - a. visual monitoring of the safety zone as set out in section 6 and shut-down requirements as set out in section 8 must be maintained; but
 - b. ramp-up procedures as set out in section 7 will not be required when seismic surveying resumes.

Operations in Low Visibility

Mitigation Measures

11. Under the conditions set out in this section, cetacean detection technology, such as Passive Acoustic Monitoring, must be used prior to ramp-up for the same time period as for visual monitoring set out in section 6. Those conditions are as follows:
 - a. the full extent of the safety zone is not visible; and
 - b. the seismic survey is in an area that
 - i. has been identified as critical habitat for a vocalizing cetacean listed as endangered or threatened on Schedule 1 of the Species at Risk Act, or
 - ii. in keeping with the considerations set out in sub-section 4(b), has been identified through an environmental assessment process as an area where a vocalising cetacean is expected to be encountered if that vocalizing cetacean has been identified through the environmental assessment process as a species for which there could be significant adverse effects.
12. If Passive Acoustic Monitoring or similar cetacean detection technology is used in accordance with the provision of section 11, unless the species can be identified by vocal signature or other recognition criteria:
 - a. all non-identified cetacean vocalizations must be assumed to be those of whales named in sections 8(a) or (b); and
 - b. unless it can be determined that the cetacean(s) is outside the safety zone, the ramp-up must not commence until non-identified cetacean vocalizations have not been detected for a period of at least 30 minutes.

Additional Mitigative Measures and Modifications

Mitigation Measures

13. Persons wishing to conduct seismic surveys in Canadian marine waters may be required to put in place additional or modified environmental mitigation measures, including modifications to the area of the safety zone and/or other measures as identified in the environmental assessment of the project to address:
 - a. the potential for chronic or cumulative adverse environmental effects of
 - i. multiple air source arrays (e.g., two vessels on one project; multiple projects), or
 - ii. seismic surveys being carried out in combination with other activities adverse to marine environmental quality in the area affected by the proposed program or programs;
 - b. variations in sound propagation levels within the water column, including factors such as seabed, geomorphologic, and oceanographic characteristics that affect sound propagation;
 - c. sound levels from air source array(s) that are significantly lower or higher than average; and
 - d. species identified in an environmental assessment process for which there is concern, including those described in sub-section 4b).
14. Variations to some or all of the measures set out in this Statement may be allowed provided the alternate mitigation or precautionary measures will achieve an equivalent or greater level of environmental protection to address the matters outlined in sections 6 through 13 inclusive. Where alternative methods or technologies are proposed, they should be evaluated as part of the environmental assessment of the project.
15. Where a single source element is used and the ramping up from an individual air source element to multiple elements is not applicable, the sound should still be introduced gradually whenever technically feasible.

Richards, Dale E

De: Abbott, Melissa H
Envoyé: August-12-13 2:03 PM
À: Richards, Dale E
Cc: Meade, James; Anderson, M. Robin
Objet: RE: table of concordance - SEA Review for Western NL

Please find attached the table of Concordance on Draft #1 of the WNL SEA Update.
Any questions, please let me know.

Thanks
Melissa



2013 05 16 -
AMEC Western ...

Melissa Abbott

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From: Richards, Dale E
Sent: 2013-August-12 11:36 AM
To: Abbott, Melissa H
Cc: Meade, James; Anderson, M. Robin
Subject: table of concordance - SEA Review for Western NL

Hi Melissa,

Tks for calling this morning. When you receive the electronic version of the table of concordance, if you could send it to Robin (copied on this message) as well as myself and Jim it would be appreciated.

Robin, presently we just have a hardcopy version. Currently, it is not yet available online. So at last chance we will scan that hardcopy and send to you electronically.

Cheers,
Dale

E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

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REVIEW COMMENTS		WHERE / HOW ADDRESSED
General Comments:		
G1	Most of the information on Protected Areas in Section 4 is buried in other subsections (under “Human Activities” and “Identified Important and Sensitive Areas for Fish and Fish Habitat”). This topic should be given a separate section all its own (e.g. Section 4.2.4), similar to Section 5 “Environmental Interactions, Mitigation and Key Planning Considerations”. It should share the same title “Protected and Sensitive Areas” and be located after the Marine Mammal section. See below for specific comments and text.	<ul style="list-style-type: none"> • New section created, as requested, called “Protected Areas” (Section 4.2.4) • Information on protected and identified sensitive areas (designated and proposed) has been moved here, and additional information added as per later specific comments. • Information on Identified “sensitive areas” from a biophysical perspective (such as fish spawning areas, etc) are still discussed in their respective chapters (fish and fish habitat etc), as they are a key component of these biophysical VECs (esp in Chapter 5), but as these come before the new “Protected and Sensitive Areas” section they are also discussed / x-referenced there as well. • This approach and structure was required, as identified sensitive areas for fish, birds etc are assessed as part of these VECs in Ch 5 (and thus, to maintain a consistent format and structure between Chs 4 and 5). • Please have a look at current proposed structure and advise if ok
G2	It would be very beneficial to have a Gulf scale map of identified sensitive areas/NPs and NMCAs/MPAs. The appropriate scale would be the one used for Figure 4.18, rather than the typical base map or the scale used for Figure 4.50 for example, which shows an area greater than the Gulf of St. Lawrence (i.e. Scotian Shelf and parts of Grand Banks), while excluding certain other portions of the Gulf (i.e. St. Lawrence estuary, Strait of Belle Isle).	<ul style="list-style-type: none"> • Figures created and added as requested (Section 4.2.4)
G3	More information should be provided on onshore to offshore drilling (e.g. risks, mitigation).	<ul style="list-style-type: none"> • Additional information on onshore to offshore drilling (esp potential environmental issues) added to relevant section of Chapter 3, and worked in throughout Chapter 5 where relevant • Generic mitigation discussed throughout



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	REVIEW COMMENTS	WHERE / HOW ADDRESSED
G4	Although seismic exploration is described in several areas, the use of wide azimuth seismic is given very little attention and there is no good information on how the Canadian Code of Practice on Seismic Noise would apply to that.	<ul style="list-style-type: none"> Additional information on wide azimuth seismic added to relevant section of Chapter 3, and worked in throughout Chapter 5. Text on wide azimuth seismic included as per later comments from C-NLOPB Additional information on <i>Canadian Code of Practice on Seismic Noise</i> added in relevant places throughout Chapter 5 (including a new Table 5.2 which provides this CoP in its entirety)
G5	The description of coastal habitats is very brief and their importance from the point of view of system productivity is not discussed. The only exception is help on the Quebec north shore which is outside the study area.	<ul style="list-style-type: none"> Additional information on coastal areas added to Chapter 4 (where existing and available information allowed for this) For eg, in Section 4.2.1.3 we added further information on the importance of coastal communities Unfortunately, there is not a great deal of additional and mappable" information on coastal areas and habitats throughout the region which could be provided in the SEA Update, esp at the scale of analysis / mapping being used. As noted in later responses, however, we have made further reference to the Coastal Atlases available for the area, incl the categories in the ASCMA 2010, ASCMA, 2011
G6	Most of the SEA information and analysis is compiled on a spatial scale that is suitable for offshore environments. The diversity and sensitivity of the coastal zone is not well captured at this scale. The SEA presents the results of coastal zone geomorphology and sensitivity studies of Cato (2011) but does not make any further use of them in the identification of habitats and areas of particular sensitivity from a fish and fish habitat perspective. Eelgrass beds are recognized as sensitive habitat around the world. They are mentioned briefly in the SEA but their locations in the study area are not mapped or identified. Similarly, estuaries in	<ul style="list-style-type: none"> See above Additional information on eel grass and estuaries incorporated throughout (where such information was available) and mapped where available



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REVIEW COMMENTS		WHERE / HOW ADDRESSED
the Study Area should be identified and the important fish species associated with them listed.		
G7	<p>Aquatic invasive species (AIS) are mentioned briefly in the report but the risks of introduction are not considered. This is a significant concern for the Western NL SEA as the study area includes coastal areas that are vulnerable to AIS introduction. Drilling platforms and rigs are often moored at a location for periods of time that allow them to pick up “hitchhikers” and then to unload those organisms or their propagules at the drilling location. Fouling communities on support vessels and barges are also a concern. Information on the NL Region AIS program can be found at www.nfi.dfo-mpo.gc.ca/AIS-EAE. The SEA should include a list of the species currently found in Newfoundland in other areas, particularly those where oil rigs and associated vessels may be moored for a period of time. A list of other potential invaders (e.g. those in other parts of the Gulf) should also be included. Table 5.1 should include the risks of AIS introduction from vessels and platforms.</p>	<ul style="list-style-type: none"> Additional information added in Chapter 4 and this issue is now referenced as a potential concern in Chapter 5 (Env Issues / Planning)
G8	<p>It should be noted that requirements under SARA could change over the time (e.g., there could be new species added to Schedule 1, new recovery strategies, action plans or management plans, identification of critical habitat). It is important to refer to the SARA Public Registry (www.sararegistry.gc.ca) to get the most up to date information and requirements for species at risk. In addition, the description of SARA processes should include more complete requirements. Recovery strategy development is noted but action plans to go with them are not and management plans for special concern listed species is not mentioned.</p>	<ul style="list-style-type: none"> Additional text and clarification on these items has been added to the general / introductory discussion of SARA included in Section 4.2.1
G9	<p>The method of interpolation used for the production of resource distribution maps (e.g. shrimp pg 160) results in unrealistic patterns of resource distribution. The resulting symbols may not be proportional to measuring points and could result in misinterpretation of actual distributions. Maps using symbols proportional to measuring points would be more accurate and would avoid misinterpretation of actual distributions.</p>	<ul style="list-style-type: none"> The approach and methods used in the presentation and analysis of the fish survey data is considered useful and entirely appropriate. These maps were created by a member of the SEA team (D Kulka) who is a recognized expert in such analysis, and moreover, the approach has been used extensively in other recent scientific studies and publications (examples added to the text) Additional text further explaining the data analysis and mapping methods and results has been provided to clarify this further.



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	REVIEW COMMENTS	WHERE / HOW ADDRESSED
		<ul style="list-style-type: none"> A map and a table showing the survey points and data by year in the data set has also been added. Added paragraphs in 4.2.1 that discusses references that provide evidence that dispute some of the top-down arguments and provide evidence for more bottom-up controlling mechanisms Changed the wording in the last paragraph in Section 5.1.3.2 to recognize that although there is disagreement on what caused this tropic shift, it is generally agreed that such changes have occurred.
G10	<p>In a couple of places (e.g., p. 157, par 1), considerable credence appears to be given to the hypothesis that snow crab abundance in the GSL is/was under top-down control (predation by groundfish) and recent studies by Frank et al. and Boudreau et al. are cited in support. These authors completely or largely ignored earlier literature that dispute this hypothesis and that argue more convincingly that temperature and cannibalism have been the main driving forces behind snow crab abundance fluctuations. See for example:</p> <p>Sainte-Marie, B. et al. 1996. Recruitment variability in snow crab <i>Chionoecetes opilio</i>: pattern, possible causes, and implications for fishery management, p. 451-478. <i>In</i>: International Symposium on Biology, Management, and Economics of Crabs from High Latitude Habitats. Lowell Wakefield Symposium Series, Alaska Sea Grant College Program Rep. No. 96-02.</p> <p>Chabot, D. et al. 2008. Atlantic cod and snow crab predator-prey size relationship in the Gulf of St. Lawrence, Canada. Mar. Ecol. Prog. Ser. 363: 227-240.</p>	
G11	<p>Parks Canada provided a detailed submission to AMEC on December 4th. This included species at risk information for the Gros Morne area and both relevant and new information for the SEA Update Area. Specific comments on Draft One can be found below.</p>	<ul style="list-style-type: none"> Recognized and appreciated. Information from this Parks Canada submission was included in the Draft #1 Report where applicable and as possible given the timing of its receipt (just days prior to the required submission date for the Draft). Additional information from Parks Canada has been added to specific sections of the report as per the specific suggestion provided in the review comments (esp, for Birds).
G12	Please check to ensure that all figures, pictures, etc. are properly referenced. For example, the two images on page 16 have no source identified.	<ul style="list-style-type: none"> Checked and revised / updated as required
G13	Please ensure that all references are included in Section 7.	<ul style="list-style-type: none"> Checked and revised / updated as required
G14	Ensure that "SEA Update Area" is consistently used throughout the document. In particular Section 5.	<ul style="list-style-type: none"> Checked and revised / updated as required (esp in Ch 5)
G15	Ensure that "SEA" is replaced with "SEA Update", where appropriate, throughout the document.	<ul style="list-style-type: none"> Checked and revised / updated as required



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REVIEW COMMENTS		WHERE / HOW ADDRESSED
G16	Check acronyms (e.g. Department of National Defence (DND) on page 262 but DND on page 260).	<ul style="list-style-type: none"> • Checked and revised / updated as required
G17	Quantitative approaches should use the best available information to adjust sensitivity threshold of specific classes of marine mammals to different types of noise (pulsed vs. continuous), for assessing radii of ensonification and levels of impacts on audition and behaviour (e.g., Wood et al. 2012). See Specific Comments.	<ul style="list-style-type: none"> • Nature and intent of this comment / request is not clear from the wording - but additional information on seismic surveys, noise and possible effects / mitigation has been added throughout Chapter 5 of the Report, in response to specific related comments provided below.
G18	Scoping information is provided in Sections 1 and 2 but not explicitly addressed until Section 3, which is a little late for the reader to understand the intended focus of the SEA. The scoping information is contradictory and the problems related to the decision to restrict consideration of production and development activities permeate the document. [Note: There was confusion about the actual scope of the SEA Update, particularly the focus on exploration activities, with only minimal discussion of the production activities – this needs to be clearer in the document, as the reader can become confused with the contradictory scoping information.] There is also a strange mix of information re. background information, issues and concerns and regulatory requirements in Sections 1 & 2. Links to later sections in the document where some of the environmental and stakeholder concerns identified are addressed in greater depth would be appropriate. See Specific Comments for comments on Sections 1, 2 and 3.	<ul style="list-style-type: none"> • Previous Chapter 3 (<i>Strategic Environmental Assessment Update: Scope, Focus and Approach</i>) has been moved ahead to now be Chapter 2, with associated edits throughout the text to address this requested change of information ordering.

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<p>G19 A few recent studies could be integrated, such as those on the megahabitats as well as the habitat of wolffish (see Dutil <i>et al.</i> 2010; Dutil <i>et al.</i> 2011; LaRocque <i>et al.</i> 2010 and related studies), but their absence in the document does not affect the understanding of the major issues for the fish.</p> <p>Document offers a clear and relatively routine items presentation. It holds 6 valued environmental components (VECs): 1. the fish and fish habitat; 2. the marine birds; 3. marine mammals and sea turtles; 4. the protected and sensitive areas; 5. the marine fisheries; 6. the endangered species. For each VEC (except for species at risk that are grouped in the VEC 1, 2 and 3) it then processes: a. the potential environmental effects; b. mitigation measures; c. environmental considerations of planning; d. cumulative effects; e. the information available and gaps. On the other hand, the document remains too general on some important aspects such as the mitigation of the effects.</p> <p>The SEA introduced general measures 'types', without specifying which are destined for every interaction / environmental effect identified by VEC. The SEA does not discuss the effectiveness of the proposed measures, the feasibility of their implementation and their monitoring. Moreover, the SEA presents gaps in current knowledge after the recommended mitigation measures and the assessment of cumulative effects.</p> <p>In the end, the reader is not able to estimate if the application of the proposed measures would prevent significant residual environmental effects. Furthermore, the study leaves some questions unanswered, including those on the effects of the increase in ambient noise on marine mammals (behavioural effects, masking, chronic effects). These effects are more difficult to identify, their scope is potentially significant and capacity to mitigate, or even to avoid completely and efficiently, has not been adequately discussed in the context of this SEA (see Specific Comments).</p>	<ul style="list-style-type: none"> Revised specific text that addresses the comment regarding wolffish from S152 and S231 The SEA Update is intended to provide a general analysis of environmental information, issues and mitigation at a level of detail and specificity that is possible and appropriate for an SEA and relevant to a strategic level of planning (PPPs). Regarding the comment that "the reader is not able to estimate if the application of the proposed measures would prevent significant residual environmental effects", these terms and concepts are more relevant to a Project EA, which involved the actual prediction and evaluation of environmental effects. Indeed, the SEA Update scoping document and subsequent direction to the study team has stated specifically that the SEA Update should NOT predict effects or evaluate their significance. The objective, rather, has been to generally identify env issues, review the available mitigation, and identify any env planning considerations and possible requirements to guide future licencing. Also, as per the C-NLOPB's note in Chapter 6, we were also asked specifically to not make specific recommendations for (new or additional) mitigation at this stage of the SEA process (this will come eventually as the process continues). Tables in Chapter 5 have been revised to add a "mitigation" column, which specifies which of the listed mitigation measures would be applicable to each identified environmental issue / interaction



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SPECIFIC COMMENTS:		
S1	<p>Section 1 Introduction, 1st and 2nd paragraphs, pg 1 – Delete the first two paragraphs and replace with the following:</p> <p>The Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) is responsible, on behalf of the Government of Canada and the Government of Newfoundland and Labrador, for petroleum resource management in the Newfoundland and Labrador Offshore Area.</p> <p>The Canada-Newfoundland Atlantic Accord Implementation Act and the Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act (the Accord Acts), administered by the C-NLOPB govern all petroleum operations in the Newfoundland and Labrador offshore area. The C-NLOPB's mandate is to interpret and apply the provisions of the Accord Acts to all activities of operators in the Newfoundland and Labrador Offshore Area; and, to oversee operator compliance with those statutory provisions. In the implementation of its mandate, the role of the C-NLOPB is to facilitate the exploration for and development of the hydrocarbon resources in the</p> <p>Newfoundland and Labrador Offshore Area in a manner that conforms to the statutory provisions for:</p> <ul style="list-style-type: none"> • worker safety; • environmental protection and safety; • effective management of land tenure; • maximum hydrocarbon recovery and value; and • Canada/Newfoundland and Labrador benefits. <p>While the legislation does not prioritize these mandates, worker safety and environmental protection will be paramount in all Board decisions.</p>	<ul style="list-style-type: none"> • Text deleted and replaced, as requested.
S2	Section 1 Introduction, 3rd para., pg 1 – Delete “Over the past decade”.	• Text deleted as requested
S3	Section 1 Introduction, 3rd para., line 3, pg 1 – Delete “The results of these SEAs...in these regions”.	• Text deleted as requested
S4	Section 1 Introduction, 3rd para., last sentence, pg 1 – Delete “The results of this SEA...gas activities in that area.”	• Text deleted as requested



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	REVIEW COMMENTS	WHERE / HOW ADDRESSED
S5	Section 1 Introduction, 4 th para., 1 st sentence, pg 1 – Insert “every five years” after “SEAS”.	<ul style="list-style-type: none"> Text inserted as requested
S6	Section 1 Introduction, 4 th para., line 2, pg 1 – Insert “The western limits of the SEA Update Area have been extended to the boundary of the ongoing Quebec SEA” after “(Figure 1.1)”.	<ul style="list-style-type: none"> Text inserted as requested
S7	Section 1 Introduction, 4 th para., line 5, pg 1 – The following text “(including associated public, stakeholder and Aboriginal consultation)” should be replaced with “(including associated public and stakeholder consultation, and Aboriginal engagement)”.	<ul style="list-style-type: none"> Text amended as requested (here and throughout)
S8	Section 1 Introduction, 5 th para., pg 1 – Delete “The results of the SEA...Offshore Area”.	<ul style="list-style-type: none"> Text deleted as requested
S9	\$1.1 Strategic Environmental Assessment: An Introduction and Overview, 1 st para., pg 1 – Delete paragraph one – “EA is a regulatory review...”.	<ul style="list-style-type: none"> Text deleted as requested
S10	\$1.1 Strategic Environmental Assessment: An Introduction and Overview, Figure 1.1, pg 2 – The title should be “The Western Newfoundland and Labrador Offshore Area SEA Update Area”.	<ul style="list-style-type: none"> Title amended as requested
S11	\$1.1 Strategic Environmental Assessment: An Introduction and Overview, Figure 1.1, pg 2 - The polygons for the existing exploration licences need to be more distinguishable between each other, i.e. bold borders. Also, it may be worthwhile to add the exploration numbers.	<ul style="list-style-type: none"> Figure amended as requested Borders added between the ELs This is intended to be an initial and general introductory Figure showing the SEA Update Area. Later Figure (Ch 3) provides similar map which indicates EL # and holders.
S12	\$1.1 Strategic Environmental Assessment: An Introduction and Overview, 1 st and 2 nd para., pg 3 – Delete paragraphs one and two – “A number of definitions...” and “SEA typically involves...”.	<ul style="list-style-type: none"> Text deleted as requested
S13	\$1.1 Strategic Environmental Assessment: An Introduction and Overview, 4 th para., pg 3 – Delete paragraphs four – “It is generally accepted...”.	<ul style="list-style-type: none"> Text deleted as requested
S14	\$1.1 Strategic Environmental Assessment: An Introduction and Overview, 5 th para., last sentence, pg 3 – Delete the sentence “By identifying...specific assessments”.	<ul style="list-style-type: none"> Text deleted as requested
S15	\$1.2 SEA Update: Purpose and Context, 1 st para., line 2, pg 4 – Delete “which was initially...2007”.	<ul style="list-style-type: none"> Text deleted as requested
S16	\$1.2 SEA Update: Purpose and Context, 1 st para., pg 4 – Insert the following at the end of the paragraph “It also identifies any relevant knowledge and data gaps and makes recommendations for future mitigation and planning”.	<ul style="list-style-type: none"> Text inserted as requested
S17	\$1.2 SEA Update: Purpose and Context, 3 rd para., pg 4 – Delete third paragraph – “This SEA Update...”.	<ul style="list-style-type: none"> Text deleted as requested
S18	\$1.2 SEA Update: Purpose and Context, last para., line 3, pg 4 – Delete “Again, the SEA Update...reviews and decisions”.	<ul style="list-style-type: none"> Text deleted as requested



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S19	§1.3 Document Organization, Chapter 2, line 2, pg 5 – Delete “(and somewhat generic)”.	<ul style="list-style-type: none"> Text deleted as requested
S20	Section 2 Offshore Oil and Gas Activities in the Western NL Offshore Area, 1st and 2nd para., pg 6 – Delete.	<ul style="list-style-type: none"> Text deleted as requested
S21	§2.1 Overview of the C-NLOPB and Associated Regulatory Processes, 2nd para., line 3, pg 6 – Delete “role” from the last sentence and delete the “Role” text. This has been previously inserted in Section 1.	<ul style="list-style-type: none"> Text deleted as requested
S22	§2.1.3 Environmental Assessment, pg 12 – Delete this section.	<ul style="list-style-type: none"> Section has been retained but pared down as discussed with C-NLOPB
S23	§2.2 Generic Description of Oil and Gas Activities, line 5, pg 14 – Delete “can be found in other sources, and”.	<ul style="list-style-type: none"> Text deleted as requested
S24	§2.2.1 Offshore Geophysical Surveys, pg 15 – This section should also present the existing alternatives to seismic surveys by air (air-guns) cannons (see Weilgart, L.S. (ed) 2010)) in order to possibly discuss this in mitigation. (General text provided in next comment).	<ul style="list-style-type: none"> Text on these “natural source” methods has been inserted as per the next review comment.
S25	<p>§2.2.1 Offshore Geophysical Surveys, 1st para., pg 14 – Replace the text with the following. In exploration, it is imperative to understand the subsurface geology of an area. Drilling is an effective way to learn what is underneath the surface but provides information for a specific location only. For this reason, prior to drilling, geophysical investigations are often conducted in order to get an understanding of what is below the surface.</p> <p>The science of geophysics applies physical principles to study the Earth. Geophysical surveys can be carried out at or near the surface and they provide information about how the subsurface varies vertically and laterally. The scale of a survey can range from an entire Earth investigation down to a small, localized area of interest. By studying and interpreting the results of various geophysical surveys, one can predict the subsurface geology.</p> <p>Types of Geophysical Survey Methods:</p> <p>Surveying methods generally fit into two categories: Those that use the natural fields of the Earth and those that require an input of artificially generated energy. The natural field methods use such Earth fields as gravitational, magnetic and electromagnetic. Knowing how these parameters generally behave, one can look for localized disruptions from the normal background value in the collected data, perhaps caused by a concealed geologic feature. In the artificially generated</p>	<ul style="list-style-type: none"> Text replaced as requested



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<p>category, most commonly seismic acquisition, acoustic waves are generated and propagate through the subsurface, reflecting off, refracting along and transmitting through layers of various characteristics. The transmission path of the waves is mapped and subsequently provides information about the geological boundaries at depth. Generally speaking, the natural source methods are logistically easier to carry out and the depths of investigation tend to be greater. Conversely, the artificial methods tend to be result in a much more detailed picture of the Earth's subsurface.</p> <p>Depending on the survey type, data can often be collected via marine, airborne or land based surveys. Factors such as physical location, cost, time, accessibility and data quality are all considered when deciding which type of survey to run. In some instances, several methods can be carried out simultaneously.</p> <p>Natural Source Methods:</p> <p><u>Gravity Surveying</u></p> <p>In gravity surveying, variations in the Earth's gravitational field due to density differences between diverse subsurface rock types are measured and recorded. A geological body, whose density differs greatly from its surroundings, will cause a change in the Earth's gravitational field. This change is known as a gravity anomaly. Gravity anomalies allow the interpreter to gain ideas about the size, depth and rock type of various features.</p> <p>Gravity data can be collected easily from an aircraft or a marine vessel using a gravimeter. Due to the relative ease of collecting from a ship, gravity data is often recorded in conjunction with a marine seismic acquisition program.</p> <p><u>Magnetic Surveying</u></p> <p>Magnetic surveys investigate subsurface geology by mapping anomalies in the Earth's magnetic field that result from varying magnetic properties of the underlying rocks. Most of the minerals that compose rocks are essentially non-magnetic; however, some iron rich minerals can produce significant magnetic anomalies. While the nature of magnetism makes it a more suitable survey</p>	



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<p>for mining type prospects, it can provide large scale information about regional geologic structure.</p> <p>Magnetic surveys are performed on land, at sea and in the air using a magnetometer and are often run in conjunction with other surveys.</p> <p><u>Electromagnetic Surveying</u></p> <p>Electromagnetic surveying measures the ground's response to propagating electromagnetic fields. Electromagnetic fields are comprised of alternating electrical and magnetic fields, as the changing of one field generates the other. As such, any conductive body beneath the surface will result in the production of strong secondary electromagnetic fields, thus making this a useful tool in remote sensing for ore bodies.</p> <p>Electromagnetic principal can also be utilized for Hydrocarbon Exploration. Controlled Source Electromagnetics (CSEM) is a marine geophysical technique used to map potential hydrocarbon accumulations below the seafloor. A dipole source that transmits an electromagnetic field is towed by the ship just above the seafloor. The field is altered by the underlying lithology, subsequently detected and recorded by a receiver array positioned on the seafloor. Interpretation of the data can help identify layers that are conductive or resistive. Typically, for hydrocarbon exploration, one looks for the more resistive features, as hydrocarbon bearing formations are relatively more resistive than the surrounding layers.</p> <p>Artificial Source Methods:</p> <p><u>Two-dimensional (2D) seismic surveys</u></p> <p>Move text in the second last paragraph (a) on page 15 here.</p> <p><u>Three-dimensional (3D) seismic surveys</u></p> <p>Move text in the last paragraph (b) on page 15 and first three paragraphs on page 17 under this heading. Also, it states that "Again, while an exploration licence is required to undertake drilling</p>	



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<p><i>activity, such a licence is not required to conduct seismic surveys...". Although no licence is required, it should be stated that it requires an authorization.</i></p> <p><u>2D-High Resolution Survey</u></p> <p>Prior to the spud of a well, an operator must ensure that the well can be drilled legally, environmentally prudently and safely at the chosen location. The exact location must be verified. The seabed and the geological units just below the seafloor must be studied in detail to assess for the potential presence of seabed features which might affect drilling and natural gas in the shallow region.</p> <p>For increased resolution of the seafloor and the shallow section surrounding the potential wellbore, 2D High Resolution data is acquired. The technique is similar to a standard 2D marine program except the source is a small volume compressed air source or a device that generates an acoustic pulse from an electrical discharge. The streamer used is much shorter and is towed (along with the source) at shallower depths than conventional 2D programs. The shallow depth allows for higher frequency content from the source and therefore higher resolution data.</p> <p>In addition, data such as side scan sonar and seafloor imagery may be gathered in conjunction with 2D High Resolution data. These data aid in studying marine life and in determining seafloor surface integrity for drilling equipment.</p> <p><i>References Used:</i> (Also include in Reference Section of the report)</p> <p>Kearey, P., Brooks, M. & Hill, I. (2002). <i>An Introduction to Geophysical Exploration</i>. Malden (MA): Blackwell Science Ltd.</p> <p>http://entry.ogp.org.uk/pubs/448.pdf</p> <p><i>An Overview of Marine Seismic Operations</i>. (April 2011) Report No. 448.</p> <p><u>Wide Azimuth Survey</u></p> <p>Seismic acquisition, in the form of a wide azimuth survey, attempts to capture wider offset data</p>	



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	<p>than a conventional seismic survey.</p> <p>Despite the fact that a source produces a spherical wave, the streamer(s), being essentially linear in a typical seismic program, will only detect rays from a small range of source azimuths. By having additional sources on vessels separate from the streamer towing vessel, the streamer is better able to detect a broader range of signal azimuths.</p> <p>The benefit to this is believed to be better data quality, in particular the capacity to resolve complex geological features, improved signal to noise ratio and the natural attenuation of multiples.</p>	
S26	\$2.2.2 Well Drilling (Exploration and Delineation), pg 19 - Why are production activities not covered here along with exploration and delineation? Many of the issues that are written off here as minor concerns during exploration (e.g. produced water) become critically important during production. Since production is the ultimate goal of all exploration it seems disingenuous to treat it as a non-issue in the SEA Update.	<ul style="list-style-type: none"> Sections reordered and expanded / reworded to place additional emphasis on production (to the degree possible and meaningful in the SEA Update) Additional references also made to env issues associated with production, esp where these may differ in importance as compared to exploration
S27	\$2.2.2.2 Well Drilling (Exploration and Delineation), 2nd para., first line, pg 19 – Replace “the end of 2011” with “January 2013”. Replace “371” with “382”.	<ul style="list-style-type: none"> Text revised as requested
S28	\$2.2.2.2 Offshore Drilling Activities, 3) Well Drilling, 7th line, pg 22 – Insert “SBMs are used in potentially difficult drilling situations, such as wells drilled in reactive shales, deep wells, and horizontal and extended-reach wells where WBMs do not offer consistently good drilling performance. SBM does not react with high clay content shales where WBM may hydrate and expand into the wellbore causing collapse of the holed or stuck drilling pipe. Gas hydrates are suppressed with SBM and the stability and flexibility of mud properties allows proper hole cleaning. SBM also prevents the formation of hydrates in blowout preventers in deepwater wells.” before the sentence beginning with “The drilling riser....”.	<ul style="list-style-type: none"> Text added as requested. It did not fit particularly well in this Section, and so it was inserted later in Section 3.2.2.3 where WBMs and SBMs are described (as discussed and agreed with C-NLOPB)
S29	\$2.2.2.3 Onshore to Offshore Drilling, para 2, pg 23 - In this section the focus should be on highlighting the activities and infrastructure that are different from offshore drilling, e.g., creation of containment ponds (infrastructure) and on-site storage of drilling muds etc. as well as produced water... (activities). It should also be noted that onshore-to-offshore drilling involves jurisdictional authorities other	<ul style="list-style-type: none"> Additional information on onshore to offshore drilling (esp potential environmental issues) added to relevant section of the (current) Chapter 3, and worked in throughout Chapter 5 Text noting other regulatory jurisdictions also added



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	than the C-NLOPB, e.g., the Provincial Dept. of Natural Resources.	
S30	§2.2.2.4 Hydraulic Fracturing Activities, pg 24 - Regarding hydraulic fracturing activities, it should be made clear if this method is proposed for use both on land and at sea. If proposed at sea, it should be clarified how liquids would be transported to and from the drill site, what the potential direct and indirect effects that accidental spills could be upon on birds, and what additional contingency planning would be required.	<ul style="list-style-type: none"> Some additional information on potential environmental issues which may be associated with hydraulic fracturing has been added to relevant section of the (current) Chapter 3, and worked in throughout Chapter 5. This includes reference to the potential requirements for, and issues associated with, materials transportation, etc and associated possibility of env issues (accidents, spills etc) Specific details on “how liquids would be transported to and from the drill site” are not available at the strategic / SEA level, and would be defined in the context of individual and specific project proposals, as would operator-specific contingency plans.
S31	§2.2.2.4 Hydraulic Fracturing Activities, 4th para., pg 25 – Hydraulic fracturing is being proposed for an onshore to offshore drilling program within the SEA Update Area.	<ul style="list-style-type: none"> Text has been updated throughout to address this recent development, which occurred subsequent to the submission of Draft #1.
S32	§2.2.2.5 Emissions and Discharges Associated with Routine Drilling Activities, para. 2, line 2, pg 27 – Insert “(OWTG)” between “Guidelines” and “(NEB et al 2010)”.	<ul style="list-style-type: none"> Text inserted as requested
S33	§2.2.2.5 Emissions and Discharges Associated with Routine Drilling Activities, para. 2, pg 27 – Insert the following sentence at the end of the paragraph beginning with “Waste materials and...”.	<ul style="list-style-type: none"> Text inserted as requested



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	<i>"The OWTG are periodically reviewed (scheduled every five years) or if circumstances determine that it is necessary (e.g. information on certain wastewater treatment technologies has shown a decrease in the loadings of the OWTG parameters to the receiving environment."</i>	
S34	\$2.2.2.5 Emissions and Discharges Associated with Routine Drilling Activities, para. 3, pg 27 – Insert the following sentence at the end of the paragraph beginning with "All chemicals to be used..." <i>"The CSG are periodically reviewed (scheduled every five years) or if circumstances determine that it is necessary (e.g. information on certain chemical usage has shown impacts to the receiving environment)."</i>	<ul style="list-style-type: none"> Text inserted as requested
S35	\$2.2.2.5 Emissions and Discharges Associated with Routine Drilling Activities, para. 3, line 2, pg 28 – This paragraph should be reviewed and rewritten. Insert "potential" before "environmental issues". The last sentence is out of place. Information on consultation should be included in Section 3.4.	<ul style="list-style-type: none"> Text revised as requested, and this information has been moved to the "hydraulic fracturing" subsection s it applies specifically to that activity
S36	\$2.2.2.5 Emissions and Discharges Associated with Routine Drilling Activities, para. 3, pg 28 - This is inadequate coverage of the extensive and controversial concerns around fracking (including many raised in Parks Canada's submission). Additional concerns regarding fracking are found on page 299 -300 – e.g. potential for inducing seismic movements, etc. Fracking should not be lumped under the heading "2.2.2.5 Emissions and Discharges Associated With Routine Drilling Activities". If it hasn't yet been used or approved in Newfoundland, it isn't routine. It should be treated in its own section that reviews in greater depth the issues associated with fracking. Also, where is the discussion of issues and concerns around onshore to offshore drilling? Many of the same problems arise but they differ considerably in their importance, e.g. sound and emissions from flaring are much more concerning in close proximity to communities, where onshore drilling / fracking is being proposed. Also, disposal of waste such as produced water and drill cuttings is a very different issue on land.	<ul style="list-style-type: none"> Text has been moved to the "hydraulic fracturing" subsection s it applies specifically to that Some additional information on potential environmental issues which may be associated with onshore drilling and / or hydraulic fracturing has been added to relevant section of the (current) Chapter 3, and worked in throughout Chapter 5 (to the degree possible and meaningful in the SEA Update, and given that this is a new proposed activity in NL)
S37	\$2.2.2.6 Oil Spills: Types and Probability of Occurrence, pg 28 - The second sentence in the first paragraph of this section should be dropped, as it only serves to excuse industrial spills.	<ul style="list-style-type: none"> Complete paragraph deleted: new intro paragraph added. Section renamed <i>Spill History of the Offshore Petroleum Industry</i>
S38	\$2.2.2.6 Oil Spills: Types and Probability of Occurrence, para 2, pg 29 - Again, what is the point here? To say that industrial oil spills are acceptable because there are natural sources of hydrocarbon release? This is not a constructive discussion given the fundamentally different	<ul style="list-style-type: none"> This paragraph is simply intended to provide the reader with one perspective on origins of 'oil in the sea'. Please see new version of the paragraph.



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	nature of natural seeps (slow and highly dispersed) and industrial spills (rapid, point source releases of large amounts of concentrated oil).	
S39	\$2.2.2.6 Oil Spills: Types and Probability of Occurrence, Figure 2.8, pg 30 - This plot would look a lot different (and make the point about low but catastrophic risk...) if it continued to 2010 when the Deepwater Horizon blowout occurred in the Gulf of Mexico (estimated to have released ~780,000 tonnes of oil), particularly as they cite information on this spill in Table 2.4 on page 32. Based on this fact the plotted reduction trends are completely inaccurate and out of date so the figure is misleading.	<ul style="list-style-type: none"> These plots have been removed and replaced with a more up-to-date tally of spill incidents and amounts in the US OCS + brief mention of the Deepwater Horizon incident.
S40	\$2.2.2.6 Oil Spills: Types and Probability of Occurrence, para.2, pg 31 - Please use metric units.	<ul style="list-style-type: none"> Edited as requested
S41	\$2.2.2.6 Oil Spills: Types and Probability of Occurrence, para 4, sentence 2, pg 31 - Of course there haven't been large spills during exploration, when only small amounts of oil are extracted. But why are we only talking about exploration?	<ul style="list-style-type: none"> The paragraph should refer to the associated Table, which is not exclusively exploration. Text has been updated accordingly. Note that the Deepwater Horizon spill was during an exploration well - preparing the well for later production and for temporary abandonment.
S42	\$2.2.2.6 Oil Spills: Types and Probability of Occurrence, 1st para., pg 32 – “Well blowouts do not necessarily cause a large discharge of oil to the environment, but are nevertheless potentially hazardous to human life and property and may result in discharges of gas to the ocean and atmosphere, as was the case in the incident in the Nova Scotia offshore area in 1984 (see earlier Tables).” A reference should be provided to support this statement. The fluids discharged from a well depend on the hydrocarbons expected to be encountered in the formation being drilled. Where a gas formation is being drilled, the well would flow gas whereas an oil formation would be expected to flow mostly oil, and where the formation contains both oil and gas, a mixture of oil and gas would flow. Please reword to reflect that there is a difference between fluids released from an oil and gas well in a blowout.	<ul style="list-style-type: none"> Noted. Paragraph has been updated.
S43	\$2.2.2.6 Oil Spills: Types and Probability of Occurrence, 1st Para., pg 33 - “An estimate based on more recent data (20 year period ending in 2005) by Scandpower (2006) was lower at 2.1 x 10-4 blowouts per well, equivalent to 1 in 4,762 wells drilled (Stantec 2011).” The referenced Scandpower report should be checked for the base time period of the report and provide a page reference as to time period of data used in the report and for the 2.1 x 10-4 blowouts per well reduction.	<ul style="list-style-type: none"> Reference to a more recent Scandpower report. (2010) has been added to the report. Blowout and well release frequencies - based on SINTEF Offshore Blowout Database 2009. - and blowout statistics have been identified. A blowout probability of 1.6 x 10-4 or 1 in 6250 wells is reported.



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		<ul style="list-style-type: none"> The blowout statistics are derived from incidents from the US GOM OCS, Canada east continental shelf, and North Sea, British, Dutch and Norwegian sector) and cover both gas and oil blowouts for the period 1 Jan 1988 to 31 Dec 2009 (SINTEF Offshore Blowout Database 2009). Referenced in a Acona Wellpro AS online exploration well Environmental Risk Assessment and Oil Spill Emergency Preparedness Analysis
S44	\$2.2.2.6 Oil Spill Probabilities for the Western NL Offshore Area, pg 33 - The subsection heading "Oil Spill Probabilities for the Western NL Offshore Area" does not reflect the content that follows it.	<ul style="list-style-type: none"> The heading has been changed to "Previous Spills in the NL Offshore Area"
S45	\$2.2.2.6 Oil Spill Probabilities for the Western NL Offshore Area, pg 33 - While the probability of a large-scale oil spill is low, operators off western NL will have to contend with ice for part of the year. This should be discussed in light of what it would mean for spill propagation and the severe limitations for oil recovery efforts. The "worst case" might be a spill under ice, rather than a strong wind event.	<ul style="list-style-type: none"> Noted. Several paragraphs have been added at the end of the 'Previous Spills in the NL Offshore Area' section. Additional discussion of this issue has also been added to Chapter 5 (under Fish and Fish Habitat, as it is the first relevant section)
S46	\$2.2.2.6 Oil Spill Probabilities for the Western NL Offshore Area, 1st Para., pg 33 - " <i>Most offshore wells ... is extremely low (LGL Limited et al 2000).</i> " Although this is a quote from the referenced report, incident is not defined and is left to interpretation. If the meaning of incident is the release of a large volume of crude such as a blowout, the statement is accurate. If the meaning of incident is anything that occurs on the facility that has the potential for a hydrocarbon to be release to the ocean, then the statement is not accurate. Please define what incident means in the context of the point being made.	<ul style="list-style-type: none"> This paragraph has been rewritten. First, introducing the NL Offshore Area spill statistics
S47	\$2.2.2.6 Oil Spill Probabilities for the Western NL Offshore Area, 1st Para., pg 33 - " <i>Notwithstanding the heightened awareness ... occurring remains quite low.</i> " There is no descriptor preceding "such accidental events" to give the term meaning. If "such accidental events" means blowout, then use blowout instead of the vague term "such accidental events".	<ul style="list-style-type: none"> This section - now called - Previous Spills in the NL Offshore Area ' has been rewritten. This revision addresses this comment.



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S48	<p>§2.2.2.6 Oil Spill Probabilities for the Western NL Offshore Area, last Para., pg 33 – The last paragraph should be rewritten. The first part of the paragraph concludes advances in technology and a stronger regulatory regime has lowered the probability of accidental events occurring. However, no information is provided to support and validate the conclusion. The authors should outline their evidentiary information supporting the conclusion. Again a phrase, “such an event”, is used without any preceding definition as to its meaning. The sentence in which this phrase occurs does not fit with the context of paragraph.</p> <p>The last part of the paragraph is a description of spill statistics in the NL offshore. This last part is not related to the first part of the paragraph.</p>	<ul style="list-style-type: none"> Please see response to comment 47 above.
S49	<p>§2.2.2.6 Oil Spill Probabilities for the Western NL Offshore Area, last Para., pg 33 – The opening line of this paragraph tells us to expect a very low probability of spills, but the subsequent statement “<i>Over that timeframe there were 436 spill incidents in total, which resulted in 435,183 L being spilled into the marine environment, ranging from 19 to 49 spills per year.</i>” makes it sound like there is in fact a very high probability of spills, indeed almost a certainty of many spills.</p>	<ul style="list-style-type: none"> Please see response to comment 47 above.
S50	<p>§2.2.2.6 Oil Spill Probabilities for the Western NL Offshore Area, last Para., last sentence, pg 33 – This sentence is misleading and not related to the information presented in the paragraph. Exploration on the west coast consists mostly of seismic and only a few exploration wells of which only one well was drilled from an offshore facility. The statistics presented in the paragraph consists of the experience with offshore operation in the C-NLOPB jurisdiction. There is no evidence to suggest an offshore drilling program on the west coast would perform better as implied by the last sentence. The sentence should be removed.</p>	<ul style="list-style-type: none"> This sentence has been removed.
S51	<p>§2.2.2.6 Oil Spill Probabilities for the Western NL Offshore Area, Table 2.7, pg 34 – The totals in the last 2 columns are higher than the sums of the other columns.</p>	<ul style="list-style-type: none"> The totals provided in the original table were mistakenly for 1997-2011. Totals have been checked and corrected to report 2007-2011. The associated numbers in the text preceding the table have also been updated.



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S52	<p>§2.2.2.6 Oil Spill Probabilities for the Western NL Offshore Area, Table 2.7, pg 35 - Although the first sentence may be factual it has nothing to do with the remainder of the paragraph which describes spill records.</p> <p>The last part of the second sentence, <i>“when 219 wells were drilled”</i>, is not related to the first part of the sentence. What the 219 wells have to do with the NL incident data base needs to be better explained.</p> <p>Please define medium and large non-blowout spills in terms of volume.</p> <p>In the first paragraph reference is made to the 92 page Angus and Mitchell 2010 report. Where information is summarized from existing EA reports, it should be properly referenced; with specific reference to those sections of the report summarized.</p> <p>Please note that the Stantec 2011 report referenced as the source of the 219 wells drilled does not reference where the number of wells drilled was obtained or derived from. Provide a proper reference as to the source of the number.</p> <p>Please provide the reference for <i>“small spills up to 1 barrel (159 L) are expected to occur at least once per drilled well”</i>.</p> <p>Please provide the page reference for <i>“it is notable that the Newfoundland and Labrador records show a decreasing number of spills through time, with a disproportionately large percentage of the spills occurring in the first number of years (Stantec 2011).”</i></p>	<ul style="list-style-type: none"> • A new paragraph is started after the first sentence which simply summarizes the recent information presented. • This material has been updated to address the comments raised. • Now reporting of spill sizes using the latest (2012) C-NLOPB statistics has been added. • Most of these comments are therefore no longer applicable.



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<p>S53 \$2.2.2.6 Oil Spills: Types and Probability of Occurrence, pg 36 - “These studies were conducted as part of the ongoing process of EA for the Old Harry prospect (located in the southern end of the SEA Update Area), and therefore the findings are not yet considered finalized”. For this reason, information from the Old Harry prospect EA should be carefully considered before inclusion in the SEA Update report.</p> <p>As part of the SEA Update issues analysis, the results of oil spill modeling undertaken in support of the Old Harry EA was incorporated into the analysis. There was discrepancy between modelling applications done by SL Ross and Environment Canada in which the oil spill behavior predicted by the former had no oil making landfall, while that conducted by EC did. A third party, ASA, examined the issue and the SEA report indicates that:</p> <p><i>“The results of the ASA (2012) assessment showed that overall the oil survival times at the surface for both Diesel and Cohasset Crude would be much shorter than those presented by Environment Canada (2012a), and comparable to those of SL Ross (2011).”</i></p> <p>Given the status of the EA for the Old Harry project (still under consideration) it is not acceptable to include information contained in that EA Report. Therefore, the above text should be removed from the report.</p> <p>The SEA Update report would have benefitted by referring to the <i>Review of Offshore Oil-spill Prevention and Remediation Requirement and Practices in Newfoundland and Labrador</i>, December 2010, Department of Natural Resources, Government of Newfoundland and Labrador, otherwise known as “The Turner Report”. This report was produced as a result of the Macondo Blow-Out in the Gulf of Mexico in 2010, and concern about a similar event occurring in the NL Offshore. Among the things explored were the pre-approved use of dispersants and also <i>in situ</i> burning. It may be appropriate to address these and other issues presented in the report in this SEA since it will provide guidance to drilling contractors and assist in a timely and effective response, if required.</p> <p>Other considerations at a strategic level could include the pre-deployment of response equipment and materials around the Gulf; the development of inter-jurisdictional protocols to respond to a major environmental emergency (including response management); inter-jurisdictional waste management coordination; inter-jurisdictional response exercising.</p>	<ul style="list-style-type: none"> • All text on previous oil spill modeling in the Western NL Offshore Area has been removed from the SEA Update Report, as requested by the C-NLOPB • Reference to the Turner Report (2010) has been added to the SEA Update, incl a brief overview of what it is and the sorts of recommendations it made. • Reference to these other potential (regional) oil spill response measures and options has been added in Ch 5



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S54	§2.2.2.6 Synthetic Based Mud Spills, 2nd para., 1st sentence, pg 39 – This sentence is not accurate. The release of whole SBMs are not permitted, however the release of certain quantities of SBM adhered to cuttings is permitted to be discharged. Please refer to the Offshore Waste Treatment Guidelines for what may be discharged from a drilling operation.	<ul style="list-style-type: none"> This first sentence has been replaced with the following: “Where there is technical justification (e.g., requirements for enhanced lubricity or for gas hydrate mitigation), operators may use synthetic based mud (SBM) or enhanced mineral oil based mud (EMOBM) in the drilling of wells and well sections. Other than the residual base fluid retained on cuttings as described in the operator’s EPP, no whole SBM or EMOBM base fluid, or any whole mud containing these constituents as a base fluid, should be discharged to the sea (NEB et al. 2010)” <p>NEB, C-NLOPB and CNSOPB (National Energy Board, Canada-Newfoundland and Labrador Offshore Petroleum Board and Canada-Nova Scotia Offshore Petroleum Board). 2010. Offshore Waste Treatment Guidelines. 28 pp.</p>
S55	§2.2.2.6 Synthetic Based Mud Spills, para 4, pg 39 - It’s much easier to read if the units of measure are consistent. In this paragraph it switches from Litres to m ³ (1 m ³ = 1,000 L).	<ul style="list-style-type: none"> Agreed. Consistency sometimes a challenge when not everyone (e.g., BSEE, C-NLOPB) reports in the same units. Edits made.
S56	§2.2.2.7 Oil Spill Prevention and Response, pg 40 - There is next to nothing in this section on oil spill response, with the exception of the topic of financial compensation. What measures will be in place to contain or clean up a spill at sea? Perhaps this section should be re-named Planning Requirements for Oil Spill Prevention and Response, as any mitigation information should be somewhere in Section 5; although it isn’t actually very well addressed there, either.	<ul style="list-style-type: none"> Additional information added to this section describing the regulatory processes and requirements that pertain to oil spill prevention, as well as response planning (Tier 1 -3 etc). Also mentions on-going C-NLOPB review of oil spill capabilities in NL etc. Additional discussion of issues raised regarding oil spill response off Western NL (e.g., ice, currents, distance from responders etc) added in Chapter 5.
S57	§2.2.2.7 Oil Spill Prevention and Response, pg 42 – Replace the text “In summary, therefore,...and C-NSOPB 2000) with the following.	<ul style="list-style-type: none"> Text revised / replaced as requested.



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<p>The basic objectives, which the proof of financial responsibility documentation submitted by an operator, are to achieve, include:</p> <ul style="list-style-type: none"> (a) Providing financial compensation to any party respecting claims attributable to the work or activity. These would include without limitation, claims by third parties, the Crown or its agents, the Board including the Chief Conservation Officer and Board delegates. Eligible claims would include those relating to loss of or damage to property, financial loss, or injury/death; (b) Restoring and preserving of the natural environment, including the sea bed, while the work or activity is going on and after it is completed and abandoned; and (c) Ensuring that the operator will properly terminate the authorized work or activity, having regard to environmental, safety, and other concerns. <p>A spill is a strict liability offence pursuant to section 161 (Federal Accord Act). Referring to section 162 and 163 (Federal Accord Act), Canada's offshore liability regime is comprised of three elements:</p> <ol style="list-style-type: none"> 1. Financial Responsibility Requirements: The applicant for an authorization (operator) must demonstrate, to the satisfaction of the appropriate regulator, proof of financial responsibility. A portion of this financial responsibility, typically in the amount of the applicable absolute liability limit, must be furnished in a form that allows the appropriate regulator unfettered access to that money in the event of a spill. 2. Unlimited "at-fault" or negligence" liability: All parties who are at fault or negligent for a spill are jointly and severally liable, without limit, for all actual loss or damage incurred by any person as a result of the spill. This can be determined by an operator accepting responsibility for its action and paying claimants out or via the courts. 3. Limited absolute liability: The operator for activity from which the spill emanated is absolutely liable up to \$30 million for all actual loss or damage incurred by any person as a result of the spill, and costs and expenses reasonably incurred by the appropriate Board, governments, or any other 	



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	person taking action in response to the spill. There is also a \$70,000,000 promissory note required to be filed by an operator with the Board.	
	The Guidelines respecting financial responsibility can be found on the C-NLOPB website at http://www.cnlopb.nl.ca/pdfs/guidelines/respecting_financial_responsibility_requirements.pdf .	
S58	\$2.2.4 Hydraulic Fracturing Activities, last para., 1st sentence, pg 25 – The sentence “Although hydraulic... in Newfoundland and Labrador...” is no longer true. An onshore to offshore program has been proposed and is undergoing review by the C-NLOPB. It will be subject to environmental assessment as well as requirements identified in the last sentence.	<ul style="list-style-type: none"> Text has been updated throughout to address this recent development, which occurred subsequent to the submission of Draft #1.
S59	\$2.3 Previous Oil and Gas Exploration in the Western NL Offshore Area, Figure 2.9, pg 44 – The title of this figure should be “Released Seismic Data Completed in the Western NL Offshore Area”.	<ul style="list-style-type: none"> Figure title updated as requested
S60	\$2.3 Previous Oil and Gas Exploration in the Western NL Offshore Area, Figure 2.11, pg 47 – Please check the land configuration shapefiles and the coastline. They appear to be slightly offset.	<ul style="list-style-type: none"> Figure checked and revised to address
S61	\$2.4 Potential Future Offshore Exploration Activities, 4th para., pg 48 – Delete paragraph.	<ul style="list-style-type: none"> Text deleted as requested
S62	\$2.5 Potential Future Petroleum Production Activities, pg 49 – This section should be renamed as “Petroleum Production Activities” and moved to a new Section 2.2.3. Predictions concerning likely numbers of production facilities in the SEA Update Area cannot presently be undertaken since no offshore discoveries have yet been made and the commercial resource potential of the area is currently unknown.	<ul style="list-style-type: none"> Relevant portions of the previous Section 2.5 have been moved to the current Section 3.2.5, in order to address the earlier comment that Petroleum Production should be more significantly discussed and integrally incorporated into the discussion. Remaining text (about possible future production) has been merged into the new Section 3.4 (potential Future Offshore Exploration and Production Activities)
S63	\$2.5 Potential Future Petroleum Production Activities, 1st bullet, line 1, pg 50 – Replace “660-1,055” with “in excess of 700”.	<ul style="list-style-type: none"> Text updated as requested
S64	\$2.5 Potential Future Petroleum Production Activities, 1st bullet, line 2, pg 50 – Replace “crude oil” with “resources”.	<ul style="list-style-type: none"> Text replaced as requested
S65	\$2.5 Potential Future Petroleum Production Activities, 1st bullet, line 3, pg 50 – Replace “to store approximately 1.2 million barrels of crude oil” with “for an oil production rate of 150,000 barrels of oil per day”.	<ul style="list-style-type: none"> Text replaced as requested
S66	\$2.5 Potential Future Petroleum Production Activities, 4th para., line 5, pg 51 – Delete “and optimize their local, provincial and national socioeconomic benefits”.	<ul style="list-style-type: none"> Text deleted as requested



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S67	Section 3 Strategic Environmental Assessment Update: Scope, Focus and Approach, pg 52 – This section should be moved to become Section 2.	<ul style="list-style-type: none"> Previous Chapter 3 (SEA Update: Scope, Focus and Approach) has been moved ahead to now be Chapter 2, with associated edits throughout the text to address this requested change of information ordering.
S68	§3.1 The SEA Update and the Associated “Strategic Decision”, 1st para, pg 53 - Scoping information again (and kind of late in the document, this would be better placed up front). But, this is phrased differently than the information on pg. 4, which as noted above, states that the SEA also, to the degree possible and meaningful, also generally considers “potential future production activity which may take place in the area should such exploration be successful in identifying commercially significant, and technically and economically viable, hydrocarbon resources”. Then there is a further statement on pg. 53 that this SEA is intended to help inform and improve the earlier (which was restricted to exploration licencing) decisions which may give rise to exploration AND DEVELOPMENT PROJECTS. This is all very contradictory – so far the document seems to state that the scope should be to inform all future decisions re. exploration and production, but then in places the document dismisses the need to and the ability to address production activities. Delete this section.	<ul style="list-style-type: none"> Section and associated text has been retained but pared down somewhat, as discussed and agreed with the C-NLOPB
S69	§3.2 Spatial and Temporal Boundaries, 1st para., line 1, pg 53 – Delete “and on identifying potential environmental issues and interactions which may occur as a result of any future oil and gas activities within this region”.	<ul style="list-style-type: none"> Text deleted as requested
S70	§3.2 Spatial and Temporal Boundaries, 1st para., line 3, pg 53 – Insert “were chosen based on historical activity in the area as well as a consideration of administrative boundaries”.	<ul style="list-style-type: none"> Text inserted as requested
S71	§3.2 Spatial and Temporal Boundaries, 1st para., line 3, pg 53 – Delete “which are defined by the marine areas under the jurisdiction of the C-NLOPB”.	<ul style="list-style-type: none"> Text deleted as requested
S72	§3.2 Spatial and Temporal Boundaries, 1st para., line 4, pg 53 – Delete “and elsewhere throughout this report”.	<ul style="list-style-type: none"> Text deleted as requested
S73	§3.2 Spatial and Temporal Boundaries, 3rd para., line 1, pg 53 – Insert “the area to be studied will not be confined to the SEA Update Area. For the purposes of the SEA Update, the area within which the environmental components that could potentially be affected by the potential exploration and production activities, including accidental events, will be considered” after (approx 36,000 km ²). Delete the remainder of text in paragraph.	<ul style="list-style-type: none"> Text inserted / deleted as requested
S74	§3.2 Spatial and Temporal Boundaries, Figure 3.1, pg 54 - Consider adding Gros Morne National	<ul style="list-style-type: none"> Gros Morne is shown in various maps throughout



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	Park to this base map. Given that the park is off limits to onshore drilling activities and extends to the low tide line it also represents a real boundary to oil industry activity in the WNLOA. Given that the paragraph prior to this map states that the larger Gulf is considered, it might be useful to add a statement in this paragraph indicating that the broader area of interest is illustrated in Figure 3.3.	<p>the Report. It is not considered appropriate to add it to additional maps inconsistently, and its inclusion on all maps will affect the presentation of relevant information on those Figures.</p> <ul style="list-style-type: none"> Chapter 5 text (and other sections) clearly states that oil and gas activities will not be permitted to occur in the Park. The report also now recognizes that PC jurisdiction also extends into the marine environment.
S75	\$3.2 Spatial and Temporal Boundaries, 1st & 2nd para., pg 55 – Delete the first and second paragraph.	<ul style="list-style-type: none"> Section and associated text has been retained but pared down somewhat, as discussed and agreed with the C-NLOPB
S76	\$3.2 Spatial and Temporal Boundaries, 3rd & 4th para., pg 55 – Move the text starting “Independently of C-NLOPB’s... and ending with “decision-making process” to Section 3.4 – Consultation Program. The Quebec SEA was brought up during the Consultation Sessions.	<ul style="list-style-type: none"> Text on Quebec SEA processes has been retained here as it is very relevant to SEA Update spatial boundaries, as discussed and agreed with the C-NLOPB
S77	\$3.2 Spatial and Temporal Boundaries, 4th para., line 3, pg 55 – Delete “Once available, the...decision-making processes”.	<ul style="list-style-type: none"> Text deleted as requested
S78	\$3.3 SEA Update: Scoping Document, 1st para., line 1, pg 56 – Delete “generally” and “information and issues which are to be included and addressed in the assessment report” and replace it with “factors to be considered, the scope of those factors and other guidelines for preparing the SEA Update report.”	<ul style="list-style-type: none"> Text revised as requested
S79	\$3.3 SEA Update: Scoping Document, 2nd para., pg 57 – Delete the text beginning with “The Scoping Document...and ending with the 10 th bullet – Consultations”.	<ul style="list-style-type: none"> Text deleted as requested
S80	\$3.4 Consultation Program, pg 58 – There should be a subsection within Section 3.4 discussing the comments received by the C-NLOPB and AMEC both during the sessions and after.	<ul style="list-style-type: none"> These submissions have now been referenced here and included in detail in the Consultation Report (Appendix A)
S81	\$3.4 Consultation Program, 1st para., line 1, pg 58 – Replace “Aboriginal consultation” with “Aboriginal engagement”.	<ul style="list-style-type: none"> Text revised throughout as requested
S82	\$3.4 Consultation Program, 2nd para., pg 58 – Delete 2 nd paragraph – “The Scoping Document for the....website for comment”.	<ul style="list-style-type: none"> Text deleted as requested
S83	\$3.4 Consultation Program, 3rd para., line 2, pg 58 – Delete “opted to considerably” and change	<ul style="list-style-type: none"> Text revised as requested



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	"expand" to "expanded".	
S84	\$3.4 Consultation Program, 5 th para., line 1, pg 58 – Delete "The underlying purpose...in the SEA Update".	<ul style="list-style-type: none"> Text deleted as requested
S85	\$3.4 Consultation Program, 5 th para., line 5, pg 58 – Insert "the" between "of" and "SEA".	<ul style="list-style-type: none"> Text inserted as requested
S86	\$3.4 Consultation Program, 3 rd para., line 2, pg 59 – Delete "which was advertised through local media".	<ul style="list-style-type: none"> Text deleted as requested
S87	\$3.4 Consultation Program, 3 rd para., line 5, pg 59 – Remove "etc". The items in brackets could be examples or "e.g.".	<ul style="list-style-type: none"> Text deleted as requested
S88	\$3.4.2 Stakeholder Meetings, 1 st para., pg 62 – "This meeting included short presentations by the C-NLOPB and another participant...". Who was the other participant?	<ul style="list-style-type: none"> Text revised to specify as requested
S89	\$3.4.2 Stakeholder Meetings, 4 th para., line 3, pg 62 – Replace "begin" with "began".	<ul style="list-style-type: none"> Text revised as requested
S90	\$3.4.3 Aboriginal Engagement, 1 st para., line 1, pg 62 – Delete "have also undertaken to consult appropriate with relevant" and replace with "contacted".	<ul style="list-style-type: none"> Text revised as requested
S91	\$3.4.3 Aboriginal Engagement, pg 62 – "These letters were sent by fax and mail to approximately 30 Aboriginal communities and organizations in Newfoundland and Labrador, Québec and each of the Maritime Provinces." Table 2.2 on page 11 of the Consultation Report in Appendix A indicates that letters were sent to 59 Aboriginal communities and organizations. "approximately 30" should be updated to "59".	<ul style="list-style-type: none"> Text revised as requested
S92	\$3.4.4 Overview of Consultation Findings, pg 62 – Comments made during meetings and open houses, as well as submitted in writing, relating to matters addressed in the SEA Update report should be inserted into a table with an indication as to where in the SEA Update report the issue or concern is addressed.	<ul style="list-style-type: none"> Table identifying and listing the general "themes" raised in the consultation program has been added, which also indicates where these are addressed in the SEA Update Report (as discussed and agreed with C-NLOPB)
S93	\$3.4.4.2 Environmental Considerations and Possible Mitigation, pg 64 - The last two bullets on this page belong in the preceding section.	<ul style="list-style-type: none"> Text revised as requested
S94	\$3.6.2 Potential Environmental Interactions and Effects, pg 69 - As stated, the analysis for each of the VECs includes "consideration of the components and activities typically associated with seismic surveys and drilling programs and the region's existing environment, in order to identify potential interactions between them". Alternatively, the methodology could include identification of desired outcomes for the identified VECs, and then work to identify how typical activities could prevent achieving these outcomes and mitigative measures and general restrictions to ensure the outcomes are achieved.	<ul style="list-style-type: none"> The approach and methods used in the SEA Update is considered appropriate and valid, and is in keeping with that reflected in the Scoping Document, the original (2005 / 2007 SEA) and in other SEAs and Projects EAs in the NL Offshore Area and elsewhere.



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S95	§3.6.2 Potential Environmental Interactions and Effects, 2 nd para., line 6, pg 69 - "This analysis ... intent it not to be ...". Should "it" be "is"?	<ul style="list-style-type: none"> Text revised as requested
S96	<p>§3.6.3 Environmental Mitigation Measures, pg 69 - "This section provides a summary overview of standard mitigation measures which are often implemented during offshore oil and gas exploration activities (...) monitoring and follow-up programs which are typically required are also discussed where applicable".</p> <p>The approach should discuss the effectiveness of the General mitigation measures proposed. Moreover, despite what is stated here, further measures in the document to each selected valued environmental component are not environmental monitoring.</p>	<ul style="list-style-type: none"> The SEA Update is intended to provide a general analysis of environmental information, issues and mitigation at a level of detail and specificity that is possible and appropriate for an SEA and relevant to a strategic level of planning The objective, therefore, has been to generally identify env issues, review the available mitigation, and identify any env planning considerations and possible additional mitigation to guide future licencing. This has, as specified in the Scoping Document, included the identification of standard mitigation measures which are typically implemented / required for such activities, as well as the potential identification of any others that may be required or appropriate (Although again, at this stage we have been instructed to not provide any such recommendations until the SEA process is further advanced). In terms of a discussion / analysis of the effectiveness of such mitigation, a detailed review and analysis of this (from the literature) is not part of the scope of this exercise, was not mentioned in the scoping document (or our workscope), nor (are we aware that it has been completed in any other SEA or Project EA in NL – and esp, not the 2005 SEA that we are updating. Moreover, many of the mitigations referenced in the SEA Update are standard and are routinely required by regulatory agencies reviewing offshore



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	<p>projects, and even in some cases are formalized and required through “codes of practice” released by government agencies (such as by DFO for seismic).</p> <ul style="list-style-type: none"> • A “measure by measure” review and analysis of the known effectiveness of each such standard and widely used mitigation is therefore not considered to be part of the scope of this exercise, and while it may be useful, is certainly not specific to the Western NL Offshore Area or this SEA Update. • To attempt to address this review comment (and later, related specific comments on Chapter 5) we have added discussions that recognize on-going questions and uncertainty around the effectiveness of certain measures, in order to acknowledge in the analysis that it is not necessary a given that all such measures will be 100% effective in all circumstances. • We suggest that this “recognition” fits best in the “data gaps” section for each relevant VEC, and have therefore included it there (as discussed and agreed with the C-NLOPB).
<p>S97 Section 4 Environmental Setting, 1st para., line 2, pg 71 – “(also referred to interchangeably as the SEA Update Area)”. If this is the first time this is mentioned, then it should also be stated at the beginning of the document.</p>	<ul style="list-style-type: none"> • This has also been added to / specified in Chapter 1
<p>S98 Section 4 Environmental Setting, 3rd para., line 4, pg 71 – Delete “This information and associated....Western NL Offshore Area”.</p>	<ul style="list-style-type: none"> • Text deleted as requested
<p>S99 §4.1.1.3 Seismicity, pg 79 – “Earthquake information for the period 1997-2012 is available from the National Earthquake Database (Natural Resources Canada 2012)”. Shouldn’t this information be provided here?</p>	<ul style="list-style-type: none"> • It is provided, in the associated “Earthquakes” Figure. Text reworked slightly to point to this
<p>S100 §4.1.1.5 Coastal Geomorphology, pg 83 - In this section there is a discussion of the Petroleum Vulnerability Index for the shoreline. The areas most vulnerable to an oil spill appear to be the</p>	<ul style="list-style-type: none"> • Text added to recognize that “many of the identified areas of relatively high sensitivity are



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<p>mouths of Atlantic Salmon Rivers (Table 4.1). These areas range from ratings of moderate to high to extreme in their sensitivity index. However, the connection between the sensitivity of these areas and the fact they are the mouths of Salmon rivers is not made. These areas would also be staging areas for smolt and adult Salmon. Most of the current drilling activity is occurring on-shore so it is likely that any spill would impact these near shore areas. There is no mention of the impact an oil spill would have on the returning adult Salmon's ability to home to its natal stream. It is suspected that this research has never been done.</p> <p>The report does acknowledge that smolt migrate through the SEA area. However, recent research by Dempson showed that smolt can spend several weeks in the Conne River estuary. Therefore, the report may be underestimating the importance of estuaries to Salmon smolt as they leave their natal rivers.</p> <p>In section 4 there is no mention of adult Atlantic Salmon migrating out of St. Georges Bay and in Figure 4.3.2 there appears to be no migration of adult Salmon within the boundaries of the SEA area.</p> <p>The report's information on American Eel life history (Dutil 1989) is outdated. With reference to Table 4.35 (page 145) American Eel can and do take up residency in estuaries. They burrow into the substrate and are found in estuaries during the winter.</p>	<p>located at or near the mouths of streams" ...</p> <ul style="list-style-type: none"> Potential effects on fish through disruption of their movements / migrations in the SEA Update Area is a key area of focus in Chapter 5. The following text in the Estuary section addresses the importance of estuaries to salmon as staging areas. To add clarity, "staging areas for migration" was changed to "staging areas for migration to and from rivers" Table in Chapter 4 has been changed to identify that salmon occur throughout the coast of the SEA area, which includes St. George's Bay. Figure is meant to provide general migration routes but an additional arrow has been added to make it clearer that salmon do migrate through the SEA Update Area. American eel row in subsequent table has been modified to include estuarine habitat and added additional (Jessop et al. 2002) reference 	
S101	\$4.1.1.5 Coastal Geomorphology, para., 6, pg 84 - Shallow Bay has the largest sand beach / dune system in western Newfoundland and should be added to this list.	<ul style="list-style-type: none"> Text added as requested.
S102	\$4.1.3.1 Wind Conditions, 1st sentence, pg 96 – Check the numbers listed in Table 4.5 with the discussion in the first sentence. Gale force winds in the range from 17.5-24.2 m/s and storm force winds in the range from 24.7-32.4 m/s.	<ul style="list-style-type: none"> The text has been corrected to match the Table results that show storm force winds in December in January, instead of October to January.
S103	<p>\$4.1.3.2 Air Temperatures, pg 100 - It is not clear what location, or average of locations, is represented by Figure 4.11 and Table 4.18.</p> <p>The authors use seasonal trends to mean seasonal distribution, and not how this changes over time.</p> <p>It would be worth mentioning the north-south air temperature gradient. Galbraith et al (2011)</p>	<ul style="list-style-type: none"> The air temperature statistics were derived for the domain spanning the SEA Update Area, as stated in the first sentence of Section 4.1.3.2. The phrase 'seasonal trends' in the text reflects the discussion of seasonal variations of monthly statistics, therefore no changes have been made. The north-south air temperature gradient as



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reports differences of 4 and 6°C in average annual and winter temperatures between Blanc Sablon and Port aux Basques (their Table 2).	reported in Table 1 (not Table 2) by Galbraith et al (2011) has been added to the text.
<p>S104 §4.1.3.3 Precipitation, pg 101 –</p> <p>i. It is surprising to find freezing rain described by one statistic for an area spanning the entire coast, given the air temperature gradient that is known to exist (see comment for S-4.1.3.2). At minimum, the area should be divided between north and south. Conditions are bound to be more severe for the northern portion, and such a report should in my view consider worse case scenarios.</p> <p>ii. The figure and table legends are sparse and it is not possible to understand what is meant by frequency of occurrence for precipitation. Consider the 40% reported for January; does it mean that precipitation occurs 40% of the time, or for unspecified periods of time during 40% of all days? The same question applies for thunderstorms and hail; is 2.5% the fraction of all time or the fraction of time when it's raining?</p>	<ul style="list-style-type: none">The presentation in the current report is intended to provide a first-order overview of the entire SEA Update Area, while it is expected that project-specific studies would consider local variability in prevailing conditions in much greater detail than the current scope allows.The text of the report was revised to more clearly state the meaning of the statistics as follows: “The statistics show the percentage of a certain distinct weather state (e.g. rain, thunderstorms, hail, etc.) for all weather reports available on record for that month (e.g. January). The weather states have been consolidated from 50 different ICOADS classifications, separating without overlap rain from freezing rain and snow (some overlap may exist between these states and mixed rain/snow, hail and thunderstorm, which represent a small percentage of the data). The weather state is reported for roughly half of all ICOADS data points in the SEA Update Area. The frequency of occurrence can most closely be characterized as representing unspecified periods of time, for a percentage of all days.”Moreover, the type and level of information and analysis completed for the Draft SEA Update is



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		comparable to that in the original (2005) SEA which we are updating.
<p>S105 §4.1.3.4 Fog and Visibility, pg 103 - This should also be divided into north and south area statistics, or perhaps even finer grained than that.</p>	<ul style="list-style-type: none"> • This is not possible or relevant at the scope / scale of an SEA. The presentation in the current report is intended to provide a first-order overview of the entire SEA Update Area. • It is expected that project-specific studies would consider local variability in prevailing conditions in much greater detail than the current scope allows. This has been referenced in the text. • Type and level of information and analysis completed for the Draft SEA Update is comparable to that in the original (2005) SEA which we are updating. 	
<p>S106 §4.1.3.5 Wave Climate, pg 105 - Wave heights are modeled to be minimum in March because of a climatological ice cover, but interannual variability of the ice cover shows that the area is often ice-free, especially the southern portion which is exposed to waves coming in from Cabot Strait. It would therefore be instructive to have results for both ice-covered and ice-free conditions. If this is not possible within the context of such a report, this caveat should be mentioned.</p>	<ul style="list-style-type: none"> • The text has been revised as suggested, stating the caveat that the interannual variability in ice cover affects the wave climate statistics for the winter months. 	
<p>S107 §4.1.4 Oceanography, pg 110 - The 3,553 cubic kilometers of water cited from Dufour and Ouellet (2007) is an error; the actual number is around 35000 cubic kilometres.</p>	<ul style="list-style-type: none"> • The topographical error from Dufour and Ouellet (2007) has been corrected in the text (from 3,553 to 35,000 cubic kilometres). 	



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S108	<p>\$4.1.4.1 Ocean Currents, pg 110 - In areas deeper than 150 m, the water column in the Gulf generally consists of a surface layer, a cold intermediate layer, and a deeper water layer (Dufour and Ouellet 2007). The surface and CIL layers merge in winter into a near-freezing layer (Galbraith, 2006).</p> <p>The 2010 seasonal circulation presented in Galbraith et al (2011) is actually not from the forecast model described in the second paragraph of section 4.1.4.1.</p>	<ul style="list-style-type: none"> The text was updated to include a statement on the merging of the surface and CIL layers in winter as described by Galbraith (2006). The text was revised to describe the model used to derive the seasonal current patterns as separate from the forecast model.
S109	<p>\$4.1.4.2 Seawater Properties (Temperature, Salinity, Density), pg 112 - In order to characterize the average and extreme conditions, data have been extracted from a geographic region consisting of the combined polygons GSL2 and GSL3 in the hydrographic climate database, a region closely approximating the SEA Update Area.</p> <p>i. The Gulf is separated into areas such as GSL2 and GSL3 in atlases and state-of-the-ocean reports because the mean conditions are different, so merging these areas may not be such a good idea. Using 1981-2010 statistics for region 5 (Esquiman Channel) from Galbraith et al. (2011) (or the latest published annual report) would yield results covering a large portion of the SEA Update Area, but exclude Cabot Strait. They should also state the year span of these averages; recent state-of-the-ocean reports (e.g. Galbraith et al 2011) use a 30-year climatology.</p> <p><i>The robustness of the statistics is higher for the depth levels closer to the surface as opposed to depths greater than 100 m, as only a small part of the SEA Update Area (as well as the measurements obtained in it) are at levels deeper than 250 m.</i></p> <p>ii. Please confirm the previous statement, since variability below 250 m is mostly interannual and variability at the surface is so rapid that it is likely aliased in CTD databases and not captured correctly. In fact, Galbraith et al (2011) do not use CTD based averages to report surface temperature, relying instead on AVHRR monthly composites.</p> <p><i>During the summer months, the surface layer becomes thermally stratified, with mean surface temperatures reaching 12.7°C in August.</i></p>	<ul style="list-style-type: none"> The report was revised to state that the conditions in different areas and specific locations are expected to differ from those presented for the overall SEA Update Area, and to recommend that project-specific EA's should take this variability into account. The scope of the current report is aimed at characterizing the overall conditions within the SEA Update Area based on all available data for the region, including the period 1915-2009. The text now states the possible issue of aliasing of the CTD data, and the lower expected robustness of these data compared to satellite data. Additional satellite-derived SST statistics have been included in Table 4.24 to complement the discussion and for comparison with the CTD-derived statistics. The text now includes a statement on the interannual temperature variability at 250 m based on Galbraith et al (2011). A statement has been included on the limited spatial coverage of 450 m values.



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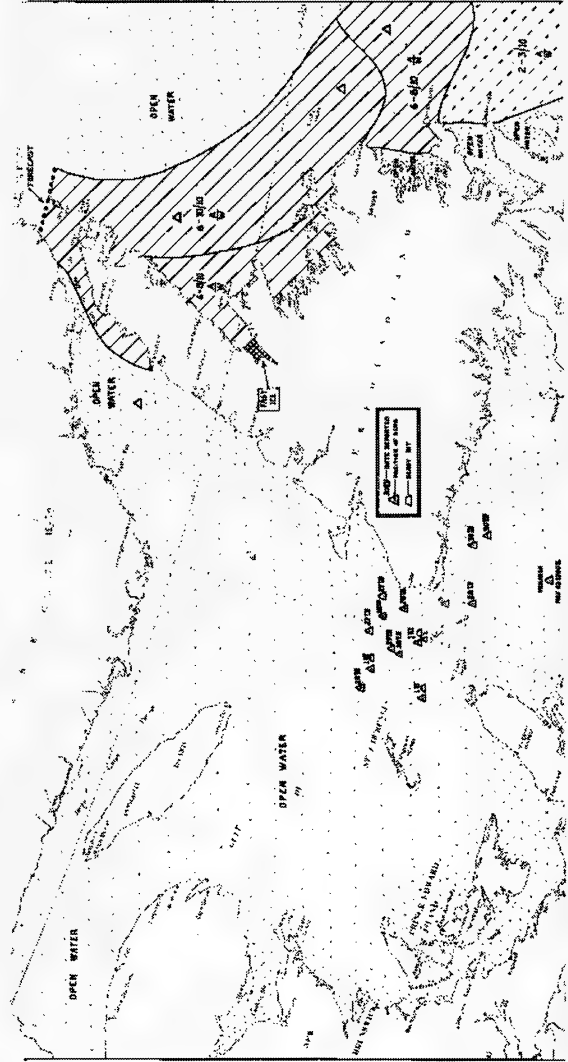
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<p>iii. Please confirm the previous statement. For recent 30 year climatology, Galbraith et al (2011) shows an average of 15.1°C in August for Esquiman Channel and over 17°C in both the Central Gulf and Cabot Strait that make up the rest of the SEA Update Area.</p> <p><i>Mean temperatures at 250 m and 450 are similarly stable throughout the year, and generally higher than those of the overlying layer, ranging from 4.5 to 5.5°C.</i></p> <p>iv. This is true for the mean, but interannual variability (as partly expressed by the standard deviation of Table 4.24) shows that temperature can exceed 6°C at Cabot Strait in some years and stay below 4°C in others (Galbraith et al, 2011). In fact, in 2012 temperatures reaching 6.9°C were recorded at 250 m in Cabot Strait in the warm inflow off of Port aux Basques.</p> <p>v. Also, it might be noted that the values reported for 450 m are only relevant for a very small area to the south of the SEA Update Area.</p> <p>vi. The authors should be cautioned against using absolute minimum and maximum values since this is relying on a single, cast for each result, and well as interannual bias. For example, the 9.2°C maximum for January at 250 m is very high and may be erroneous. Please confirm the result that maximum surface temperature is 11.1°C in March yet only 1.3°C in April.</p> <p>vii. Perhaps it would be instructive to show the temperature and salinity climatology using shaded outlines of temperature and salinity profiles, as in Figures 35 to 38 of Galbraith et al (2011). The authors might find that statistics are not very reliable for some month of the year when few surveys have been done.</p> <p>viii. It is unclear if the standard deviations reported in Table 4.24 to 4.26 refer to individual casts, or to ensemble monthly averages (such is done in the atlas of Petrie et al (1996) and annual reports such as Galbraith et al (2011)).</p>	<ul style="list-style-type: none"> Additional satellite-derived SST statistics have been included in Table 4.24 to complement the discussion and for comparison with the CTD-derived statistics. The report was revised to acknowledge the limit of statistics to describe conditions for months when data are sparse. The standard deviations of the seawater property statistics represent un-weighted, ensemble monthly averages. Type and level of information and analysis completed for the Draft SEA Update is comparable to that in the original (2005) SEA which we are updating.
<p>S110 \$4.1.5 Extreme Events, pg 115 - Would the extreme wave heights be even higher in winter without ice cover? Why are wave heights lower in winter than in summer in section 4.1.3.5 and the reverse true for extreme wave heights? Would extremes be much higher in the southern area in Cabot Strait? If so, shouldn't it be treated separately?</p>	<ul style="list-style-type: none"> The text was revised to state the caveat that the extreme wave heights would indeed be expected to be higher in winter during periods without ice cover (notably in February and March, see also



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	<p>comment S106), and ice presence will vary significantly by location.</p> <ul style="list-style-type: none"> The low wave height mean values in February and March, as shown in section 4.1.3.5, reflect the ice presence at the location of the selected MSC50 node #6014618.
<p>S111 §4.1.6 Ice Conditions, pg 117 - The sea ice section of the document is well summarized and referenced the latest climate information generated by the Canadian Ice Service (CIS). However, the SEA does not mention any aspect of the deformed ice subjected to prolonged period of northwesterly winds during the winter months; some of the ridged ice can develop significant underwater keels. Environment Canada recommends that the SEA should address climatology and potential impacts of deformed and ridged ice.</p>	<ul style="list-style-type: none"> The presence (and possible implications) of deformed and ridged ice in the SEA Update Area has been added / recognized in the text as suggested.
<p>S112 §4.1.6.1 Sea Ice, pg 117 - Please note that warm surface waters often flow into the Gulf of St. Lawrence in winter on the eastern side of Cabot Strait (Galbraith 2006 Fig. 12, Galbraith et al 2011 Fig. 22 or more recent reports), creating that ice-free area in the climatology. Also, the past few years have been nearly ice-free in the Gulf, a situation bound to be more common with climate change.</p>	<ul style="list-style-type: none"> The suggested observations of warm surface water inflow on the eastern side of Cabot Strait have been included in the text as documented by Galbraith (2006) and Galbraith et al (2011).
<p>S113 §4.1.6.2 Icebergs, Figure 4.23, pg 119 – Does the data represent a specific time of year?</p>	<ul style="list-style-type: none"> No, the data represents the annual probability of occurrence including all months of the year.
<p>S114 §4.1.6.2 Icebergs, pg 119 –</p> <p>i. Although the International Iceberg Patrol's (IIP) iceberg database is very reliable, it is more so for the water east of Newfoundland. Iceberg information in the Gulf of St-Lawrence area or west of Newfoundland might not include all iceberg sightings, but certainly most.</p> <p>Before 2006, when CIS and IIP decided to merge their iceberg sighting database, each agency would maintain their own. Iceberg information entered in CIS database would contain all sightings; IIP's database could have been different as icebergs sighted west of Newfoundland stood no chance of ever affecting the Iceberg Limit east of Newfoundland. To establish this (eastern) iceberg limit has always been IIP's mandate.</p>	<ul style="list-style-type: none"> The suggested references to additional sightings in different databases have been included in the report. As the iceberg sightings presentation in the current report is expected to include the vast majority of observations in the area for the last 50 years, it is considered to serve the scope of the current report which is to provide a first-order overview for the SEA Update Area.

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<p>It was only in February 2011 that CIS and IIP started to issue a “common look and feel” – North American Ice Service (NAIS) Iceberg chart which promotes an iceberg limit (east of Newfoundland) as well as a western iceberg limit in the Gulf area (when warranted).</p> <p>CIS has depicted a western iceberg limit on their iceberg charts for at least 20 years. IIP has only started to do so since CIS and IIP merged databases and harmonized the NAIS iceberg chart in February 2011.</p> <p>There is also another database of historical records of ice / iceberg distribution around Newfoundland; it is the long-time dedicated work of Brian T. Hill and promotes reconstructed charts for the spring months up to 1958. http://researchers.imd.nrc.ca/~hillb/icedb/ice/</p> <p>Recently, some older ice charts for the Gulf of St-Lawrence have been made available electronically including iceberg reports plotted on ice charts dated back in May of 1960 and 1962. They are included below. Although the icebergs are not all in the area of this SEA, their presence in the region remains.</p>	<p>.</p>



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<div> <p>The report has been updated to include the observation of additional historic iceberg sightings from the east via southern Newfoundland and Cabot Strait, as suggested.</p> </div>	

These graphics can be enlarged for better viewing results.

ii. Environment Canada suggests that the SEA also mention that many historical iceberg sightings – especially those west of Port-Aux-Basques – have a tendency to approach from the east via southern Newfoundland and Cabot Strait (see Figure 4.18 Mena circulation Pattern in the Gulf of St. Lawrence).

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These graphics can be enlarged for better viewing results.

- ii. Environment Canada suggests that the SEA also mention that many historical iceberg sightings – especially those west of Port-Aux-Basques – have a tendency to approach from the east via southern Newfoundland and Cabot Strait (see Figure 4.18 Mena circulation Pattern in the Gulf of St. Lawrence).

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<p>iii. It would also be helpful to be able to convert a 50-year period into a percentage per year for statistical analysis purpose. However, if the sightings were broken down into a monthly distribution, one would likely find that fewer sightings occur during certain months of the year (fall and winter) because of warmer water temperatures and generalized lack of icebergs in southern latitude during those months. Most observations would tend to occur during the spring and summer months. This time frame is also highly correlated to the break up pattern of the sea ice in the northeastern portion of the Gulf as far as influx is concerned through the Strait of Belle Isle and the generalized presence of iceberg in southern latitudes during this time frame.</p> <p>If such a study was undertaken, perhaps a different seasonal probability could be derived which could be of use if broken down in various regions of the SEA Update Area. For example, one may find that the large icebergs sighted off Corner Brook could have all been the result of an anomalous ice year and/or iceberg year rather than a 5% chance per year of occurrence.</p> <p>Environment Canada suggests that it would also be valuable to present the monthly probability of occurrence of icebergs for various regions of the SEA. This would provide more specific guidance about the seasonal patterns of iceberg occurrence.</p>	<ul style="list-style-type: none"> • This represents a first-order overview of their spatial distribution in the region. • No changes to the data plots have been made, as the plots in the Figure already show the percentage per year (labelled as 'annual probability' in %) of iceberg occurrence. • The text has been revised to state that significant spatial and seasonal variability of iceberg occurrence is expected within the SEA Update Area, and that project-specific studies would take into account a more comprehensive analysis of site-specific conditions. • Type and level of information and analysis completed for the Draft SEA Update is comparable to that in the original (2005) SEA which we are updating.
<p>S115 \$4.1.6.3 Superstructure Icing Potential, pg 122 - Is icing reduced with increased ice cover and is this accounted for? Probably not, but should be explained. It would be better to have tables done without ice cover (as is likely the case since the maximum of Table 4.24 occurs in February?) as it represents the worst case scenario.</p>	<ul style="list-style-type: none"> • The presence of ice cover is not explicitly included in the algorithm by Overland (1990) – the predicted values instead rely on air and sea temperature, and wind speed from ICOADS observations that have not been screened for presence of ice. • However, observations from periods and locations with ice cover may be indirectly limited to the extent that ship traffic may be sparser in ice-covered areas.
<p>S116 \$4.2.1.1 Approach and Key Information Sources, (EBSA), pgs 124-125 -The SEA states: "...For each of these IAs, the various layers were evaluated using the three criteria/dimensions considered independently (i.e. IA with high uniqueness value of 3) and cumulatively (i.e. IA that has medium uniqueness value of 2 and a medium aggregation of 2)..."</p>	<ul style="list-style-type: none"> • To address the first comment, we added to the example for a cumulative example ((i.e. IA with high uniqueness value of 3 and cumulatively (i.e. IA that has medium uniqueness value of 2, a medium



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<p>In fact, the second type of analysis considers the cumulative importance of a wide range of attributes (dimensions). By doing so, areas that possess a low or intermediate rank across a large number of EBSA dimensions and thematic layers can also be considered potential EBSAs.</p> <p>Add Pelagic fishes (another thematic layer used) in Table 4.29.</p> <p>This table should be divided into two components since there is no relationship between items in the first column (thematic layer) and those in the two other ones (second column: criteria/dimension; third column: Description of Criteria/Dimension) and thus, no link between items in the same line.</p> <p>The SEA states: "...DFO identified ten EBSAs in the Gulf of St. Lawrence (DFO 2007), one of which is located almost entirely within the SEA Update Area..."</p> <p>For the Estuary and Gulf of St. Lawrence (EGSL), analyses leading to the identification of the ten potential EBSAs were based on the best scientific data available. However, several data sets were not available at the time of the analysis (because of lack of geo-referencing or suitable electronic versions) and several large areas of the Gulf were poorly sampled, leaving data gaps. So, at least for the EGSL, the EBSAs do not cover all the areas or species that contribute in a significant way to the dynamic of the system. For example, it is important to keep in mind that only a small proportion (approximately 0.02%) of the benthic invertebrate species known to be present in the EGSL was considered in the EBSA process (Chabot et al., 2007). In particular, the lack of data for the coastal zone (e.g., a portion of the west coast of Newfoundland) is a major gap (Savenkoff et al. 2007).</p> <p>Chabot, D., A. Rondeau, B. Sainte-Marie, L. Savard, T. Surette, and P. Archambault. 2007. Distribution of benthic invertebrates in the Estuary and Gulf of St. Lawrence. DFO Canadian Science Advisory Secretariat Research Document 2007/018 (Updated and translated into English: October 2010).</p> <p>Savenkoff, C., M.-N. Bourassa, D. Baril, and H.P. Benoit. 2007. Identification of ecologically and</p>	<p>aggregation of 2, and uniqueness value of 2).</p> <ul style="list-style-type: none"> • To address the second comment, we added pelagic fishes to table for another thematic layer. • To address the next comment, we divided the table as suggested. • To address fourth comment, we added the paragraph suggested to the end of this section.



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<i>biologically significant areas for the Estuary and Gulf of St. Lawrence. DFO Canadian Science Advisory Secretariat Research Document, 2007/015.</i>		
S117	§4.2.1.1 Approach and Key Information Sources, (DFO Multi-Species Surveys), pg 125 - The nearshore region (depths < 37 m) was not sampled by the research vessel surveys.	<ul style="list-style-type: none"> Added sentence to this section explaining depth covered by survey (<37m)
S118	<p>§4.2.1.1 Approach and Key Information Sources, para 2, pg 125 - This EBSA should be described here, indicating exactly what features and resources led to its identification.</p> <p>Page 126, Figure 4.25: This figure should be scaled so the whole Gulf of St. Lawrence can be seen, particularly given the statements on pg. 124 of considering the Gulf ecosystem holistically. To achieve a holistic approach, integrated information about the marine ecosystems of the Gulf needs to be presented, this is done inconsistently – e.g. the discussion of fish ecosystems throughout the Gulf on pg. 153, which is good. In addition, it is hard to follow when some of the areas being referred to (e.g Magdalen Shallows) are not shown on a map.</p>	<ul style="list-style-type: none"> This section serves merely to introduce the data sources and briefly describe the criteria of defining an EBSA; the EBSAs themselves are described in detail in subsequent sections. Figure has been expanded to show all EBSAs in the Gulf and some important features that are identified The purpose of using the same map templates throughout the Report has been to facilitate comparisons between Figures as required and relevant
S119	Section 4.2.1.1 Ecologically and Biologically Significant Areas (EBSA), 2nd paragraph, pg 125 – Include the names of the ten EBSAs and label them in Figure 4.25.	<ul style="list-style-type: none"> Figure has been revised to show and name all EBSAs in the Gulf All 10 EBSAs have been listed in the text
S120	§4.2.1.1 Approach and Key Information Sources, (DFO Multi-Species Surveys), Figure 4.25, pg 126 - This figure shows all the EBSAs in the SEA region with numbers demarking each individual area. A name should be provided to coincide with the number for ease of interpretation in the discussion.	<ul style="list-style-type: none"> Figure has been revised to show and name all EBSAs in the Gulf
S121	<p>4.2.1.2 Plankton, Zooplankton, 2nd para., pg 129 - Themisto libellula is not a recently established species. It has been observed historically in the Belles-Isles Strait and its abundance was believed to fluctuate in response to the volume of Labrador Shelf water advection in the northwest GSL in winter. This relationship broke down during the 2000's, suggesting a more complex interplay between environmental conditions (see Harvey & Devine 2009 and previous Research Documents published by DFO on zooplankton sampled as part of the Atlantic Zone Monitoring Program). This species could be almost absent some years, indicating that it is not established in the GSL (presence due to transport and favorable local conditions in some years).</p> <p>In addition, the importance of Themisto libellula is highly overstated in the document. It</p>	<ul style="list-style-type: none"> Left in the information on <i>T. libellula</i> as it is also regarded as important in the new reference as well (Harvey & Devine 2009); more text, however, has been added on other recent trends thereby diminishing the relative importance of text for this species Added updated information from Archambault et al (2010) and Harvey and Devine (2009); Added table of top ten zooplankton from AZMP dataset for Bonne Bay Station



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<p>represents less than 10% of the biomass of the macrozooplankton on average over the years, and less than 5% in 2007 and 2008 (Harvey & Devine 2009). Considering that macrozooplankton biomass represents no more than 10-15% of the total zooplankton biomass (and Themisto 1-1.5% of total biomass), it is difficult to affirm that fluctuations in this species abundance would represent an 'important' change in the zooplankton community.</p> <p>If the de Lafontaine et al. (1991) reference is correct, a more recent literature is available to describe the zooplankton community in the GSL in general and in the northeast GSL in particular. Archambault et al. (2010) published a review of the marine biodiversity (including the zooplankton), with the St. Lawrence system considered as a distinct unit.</p> <p>The Atlantic Zone Monitoring Program (AZMP) conducted by DFO since the late 1990's also provide some information about the zooplankton community (see Harvey & Devine 2009).</p> <p>Plourde & McQuinn (2009) presented acoustic data that also showed the potential for high krill biomass along the slope of the eastern Esquiman Channel (see description in page 9). Giving the importance of krill in the food-web and for large marine mammals (some listed in the SARA list), this information should appear more clearly in the document.</p>	
<p>S122 §4.2.1.2 Plankton, Table 4.30, pg 130 - Why isn't EBSA 10 (West coast Nfld) included in this table?</p>	<ul style="list-style-type: none"> • BSA #10 (West Coast NF) is described first and in the text as it is clearly the most relevant. • All other EBSAs are listed in table and they are of secondary relevance • Same pattern for all EBSA sections
<p>S123 §4.2.1.3 Benthos and Coastal Habitats, para 2, pg 132 - In this section it should be mentioned that a significant portion of the intertidal zone in the WNLOA falls under the jurisdiction of Parks Canada (i.e. Gros Morne and Port au Choix).</p>	<ul style="list-style-type: none"> • Reference to this has been added, but under "Protected Areas" sections
<p>S124 §4.2.1.3 Benthos and Coastal Habitats, pg 132 – It is confusing that this section only deals with a few species, leaving "commercial" invertebrate species that are living or closely associated with the seafloor out: they are handled in section 4.2.1.4, in Table 4.33. The details on these species are split between section 4.2.1.4 and 4.2.1.5.</p> <p>It would be less confusing if benthic invertebrates were treated in contiguous sections. In fact,</p>	<ul style="list-style-type: none"> • Added new table listing all relevant benthic species caught in scientific surveys and moved original benthic invert table to this section as suggested by reviewer. • Left distribution maps in Section 4.2.1.5 as this flow works best for all of the information in this



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<p>Table 4.33 could very well be within section 4.2.1.3. Rationale: for fish, section 4.2.1.4 covers both commercially and non-commercially exploited species, keeping all fish together. The same should be done for benthic invertebrates and the most logical section for them is 4.2.1.3.</p> <p>It is suggested to put the distribution data presently in Table 4.38, section 4.2.1.5, also within 4.2.1.3. However, if the structure of the report cannot be altered for this, and distribution information must be kept in 4.2.1.5, it could be mentioned at the beginning of section 4.2.1.3 that distribution data are shown in 4.2.1.5 instead of leaving the reader guessing. There should also be an explanation for the choice of benthic invertebrate species that are covered in 4.2.1.3 and 4.2.1.5. In the first section, the report seems to mention all species, even those that are not exploited commercially. More species should be included in 4.2.1.3 (see comments regarding page 133). Section 4.2.1.5 seems to be restricted to commercial species, although the non-exploited striped pink shrimp is included, whereas some mollusks that may be exploited (e.g., waved whelk) are not included.</p>	<p>Chapter, but directed the reader to their presence in this later section</p> <ul style="list-style-type: none"> Distribution maps were determined based on the top three species that had high degree of overlap with the SEA Area. American lobster and snow crab were also added due to their commercial importance
<p>S125 \$4.2.1.3 Benthos and Coastal Habitats, pgs 132 – “<i>The benthic species distribution in the lower Gulf estuary is largely controlled by oxygen tolerances (Belley et al 2010) as some of the bottom waters are hypoxic</i>”. This is a vague and inaccurate interpretation of Belley et al. (2010). That study only included deep stations at the bottom of the Laurentian, Esquiman and Anticosti Channels. There is a gradient in dissolved oxygen (DO) in the deep channels.</p>	<ul style="list-style-type: none"> Removed the phrase quoted and rephrased that numerous physical factors play a role in distribution Cited Belley et al. (2010) as an example of how DO is important in some areas.



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	<p>Those closer to Cabot Strait are less hypoxic (50-55% sat.) than those near the head of deep channels (20-30% sat.). Belley et al. (2010) found differences in benthic communities along this gradient. The present report does not include a description of the patterns of DO observed in the NGS and the causes for these patterns, even though it is relevant for the SEA update area. Section 4.1.4.2 should cite Gilbert et al. (2005, 2007). Also the above sentence gives the impression that DO is the main factor controlling the distribution of benthic species. Depth and other variables correlating with depth (in addition to DO), temperature, sediment types, etc. are important in delimiting distributions of benthic invertebrates.</p> <p>Gilbert D., Sundby B., Gobeil C., Mucci A. & Tremblay G.- 2005. A seventy-two year record of diminishing deep-water oxygen in the St. Lawrence estuary: the northwest Atlantic connection. <i>Limnology and Oceanography</i>, 50, 1654-1666.</p> <p>Gilbert D., Chabot D., Archambault P., Rondeau B. & Hébert S. 2007.</p> <p>Appauvrissement en oxygène dans les eaux profondes du Saint-Laurent marin - Causes possibles et impacts écologiques. <i>Le Naturaliste Canadien</i>, 131, 67-75.</p> <p>Paragraph 2. "combination of physical factors including predation, grazing". These two factors are biotic, not physical.</p> <p>Last paragraph. "shallow subtidal" and "deep subtidal" ... should be referred to as infralittoral and circalittoral or shelf habitats. Please identify the "lower Gulf estuary"?</p>	<ul style="list-style-type: none"> Added sentence that indicated other factors that are also important to benthic distributions Did not add a section on DO in the Gulf in 4.1 – Like other factors listed by the reviewer, we did not feel it was necessary or possible to define distributions of DO levels across the Gulf at this regional scale of analysis We did list it as a contributing factor in habitat suitability. Paragraph 2 adjusted and clarified. Infralittoral and circalittoral added to definitions. Reference to lower Gulf estuary removed in previous edits.
S126	<p>§4.2.1.3 Benthos and Coastal Habitats, 1st para., pg 133 – A very short list of "deep subtidal" species is given. This is very incomplete, even though one species (the striped shrimp, <i>Pandalus montagu</i>), is added in section 4.2.1.5, p. 158 and 161. Considering that the authors wanted to take an ecosystemic approach that includes potential prey to commercial species, this list may not be complete. For instance, Chabot et al. (2007) is not cited, yet provides data on the relative abundance or concentration of many more species for the entire estuary and GSL, including within the SEA update area. In particular, Chabot et al. (2007) noted that the following species or groups were present, and sometimes abundant, within the SEA update area : Ophiuridae (Fig. 21), shortfin squid (Fig. 28), lesser bobtail squid (Fig. 29) (even though the squids are not truly benthic, there is</p>	<ul style="list-style-type: none"> Added table of more complete list of benthic inverts in Section 4.2.1.3 and text based on the reference including species listed in the comment; Explained why only certain invertebrate species were chosen for habitat and spawning summary. Added caveat that survey did not included shallow areas. Removed "occur"



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<p>no other section in the present report that includes them), northern Atlantic octopus (Fig. 30), many non-commercial shrimp such as the pink glass shrimp (Fig. 32), <i>Pontophilus norvegicus</i> (Fig. 37), <i>Atlantopandalus propinquus</i> (Fig. 38), <i>Spirontocaris lillejorgii</i> (Fig. 39), <i>Lebbeus polaris</i> (Fig. 41), <i>Argis dentata</i> (Fig. 42), <i>Eualus macilentus</i> (Fig. 43), <i>Sabinea septemcariata</i> (Fig. 44), <i>Sars shrimp</i> (Fig. 54), spiny crab (Fig. 62). Some species were present but less important in the SEA Update Area than elsewhere in the NGSL: Parrot shrimp (Fig. 45), <i>Eualus fabricii</i> (Fig. 46), <i>Sclerocrangon boreas</i> (Fig. 47). It should be noted that even this list is incomplete because Chabot et al. (2007) did not survey the coastal zone (depth < 50 m).</p> <p>Chabot D., Rondeau A., Sainte-Marie B., Savard L., Surette T. & Archambault P. 2007. Distribution of benthic invertebrates in the Estuary and Gulf of St. Lawrence. <i>Canadian Science Advisory Secretariat Research Document, 2007/018</i>, vii + 108.</p> <p>In addition, lobster, rock crab and sea scallops (<i>Placopecten</i>) would not be considered to be “deep subtidal invertebrates” over most of their distribution range in the GSL and in the SEA Update Area in particular – shallow subtidal as defined in the document is far more appropriate. Indeed, Table 4.33 details that sea scallops tend to occur at depths less than 20 m.</p> <p>Third paragraph under Corals - remove “occur” in “There is, however, a known presence of corals and sponges occur within the Gulf.”</p>	<ul style="list-style-type: none"> • Coral figure has been revised to group species more logically and concisely
<p>S127 §4.2.1.3 Benthos and Coastal Habitats, Figure 4.27, pg 134 – The legend of Figure 4.27 could have been structured hierarchically, for example with Pennatulacea appearing before species belonging to that group and Alcyonacea preceding families and species it encompasses. The same could be said for Scleratina.</p>	<ul style="list-style-type: none"> • Revised sentence and used suggested text
<p>S128 §4.2.1.3 Benthos and Coastal Habitats, 1st para., line 1, pg 136 – Delete “are” in “These habitats are can vary...”. A bit further on in this paragraph, rephrase “when limiting resources of nitrogen and phosphorus are brought to marine waters from freshwater sources” as “when depleted marine nitrogen and phosphorous are renewed by freshwater inputs”.</p>	<ul style="list-style-type: none"> • Revised sentence and used suggested text



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<p>S129 §4.2.1.3 Benthos and Coastal Habitats, pgs 133-136 – The following paper is critical in illustrating the relationship of Deep Sea Corals to fish larvae (particularly for the COSEWIC special concern Redfish species) and should be incorporated into SEA Update report.</p> <p><i>Baillon, S., Hamel, J.F., Wareham, V.E., and Mercier, A. 2012. Deep cold-water corals as nurseries for fish larvae.</i></p> <p><i>Frontiers in Ecology and the Environment</i> 10:351–356. http://dx.doi.org/10.1890/120022</p> <p>The following references will provide additional insight to the importance of Eelgrass and nearshore habitats, respectively:</p> <p><i>DFO. 2009. Does eelgrass (Zostera marina) meet the criteria as an ecologically significant species? DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/018. http://www.dfo-mpo.gc.ca/csas/Publications/SAR-AS/2009/2009_018_e.pdf.</i></p> <p><i>Cote, D., Gregory, R., Morris, C.J., Newton, B.H., and Schneider, D.C. 2013. Elevated habitat quality reduced variance in fish community composition. Journal of Experimental Marine Biology and Ecology 444:22-28. http://dx.doi.org/10.1016/j.jembe.2012.11.006.</i></p> <p>The first paragraph on estuaries and their importance should be updated. The Corell (1978) reference is useful but dated. Recent work such as that of Greenlaw et al. (2011) might be more relevant.</p> <p><i>Correll, D.L. 1978. Estuarine productivity. BioScience, 28, 646-650.</i></p> <p><i>Greenlaw, M.E., Roff, J.C., Redden, A.M. and Allard, K.A. 2011. Coastal zone planning: a geophysical classification of inlets to define ecological representation. Aquatic Conserv: Mar. Freshw. Ecosyst., 21: 448–461. doi: 10.1002/aqc.1200.</i></p>	<ul style="list-style-type: none"> Added information from Baillon et al. (2012) to show importance of corals for fish larval habitat Added section on Eelgrass stressing its importance based on provided references Added Figure of known eelgrass locations / distributions Revised section on estuaries to reflect more current literature.



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S130	<p>\$4.2.1.4 Marine Fish (Invertebrate and Finfish Species), Table 4.33, pg 137 - This table should be in 4.2.1.3. Why were only these species (American lobster, Atlantic sea scallop, blue mussel, deep sea corals and sponges, northern shrimp) selected for this invertebrate table? The fish table (4.34) includes many more species of which many non-commercial species. Here only the corals and sponges are included. Many more benthic invertebrates could have been included in this table (as noted in comments re: page 133) to reflect their overwhelming contribution to marine biodiversity.</p> <p>American lobster - They are distributed along the Atlantic coast from Cape Hatteras to Strait of Belle Isle, NOT "throughout the Atlantic Ocean".</p> <p>Blue mussels (<i>Mytilus edulis</i>) - Replace by <i>Mytilus</i> spp.; <i>M. trossulus</i> occurs throughout the Gulf of St. Lawrence and is almost impossible to distinguish from <i>M. edulis</i> without molecular probes. <i>Mytilus</i> species are important commercially, but mostly or only through aquaculture.</p> <p>Northern shrimp - Northern shrimp do not spawn in June-July. They spawn in autumn. Hatching happens in Spring (April-June). See for instance Ouellet et al. 2011. The table also states that shrimp spawn at least once a year, as if they might spawn more often. This is false, they spawn once a year. See the reference:</p> <p>Ouellet P., Fuentes-Yaco C., Savard L., Platt T., Sathyendranath S., Koeller P., Orr D. & Siegstad H. 2011. Ocean surface characteristics influence recruitment variability of populations of northern shrimp (<i>Pandalus borealis</i>) in the Northwest Atlantic. <i>ICES J Mar Sci</i>, 68, 737-744.</p> <p>Snow crab - The proper temperature limit for snow crab is 4-5 °C (see Figure 2 in Sainte-Marie et al. 2005 Critères et proposition pour une définition des unités de production du crabe des neiges (<i>Chionoecetes opilio</i>) dans l'estuaire et le nord du golfe du Saint-Laurent. Secrét. can. consult. sci., Doc. de rech. 2005/059, 20 p.) where occurrence drops off sharply above 4 °C). Please clarify the following: "Temperatures > °C are known to be detrimental."</p>	<ul style="list-style-type: none"> There are now two invertebrate Tables in Section 4.2.1.3 including one more complete that illustrates large diversity in the Gulf and one with habitat and spawning information Revised table for lobster, mussels, northern shrimp, and snow crab based on suggestions
S131	<p>\$4.2.1.4 Marine Fish (Invertebrate and Finfish Species), Tables 4.33-4.35, pgs 137-149 - It would be useful to identify if any of the species listed in these tables are further discussed in the Species at Risk sections as well.</p>	<ul style="list-style-type: none"> Put footnotes in Tables to identify species with SARA designation, as suggested



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S132	<p>§4.2.1.4 Marine Fish (Invertebrate and Finfish Species), Table 4.34, pgs 139-149 – The table has a column titled Habitat and Distribution, yet distribution maps are found in section 4.2.1.5.</p> <p>What criteria were used to select which species to include in Table 4.34? Non-commercial species are included, but not all those found in the area. Nozères et al. (2010) list the species found in the GSL. Bourdages and Ouellet (2011) should have been consulted and cited. In particular, these authors provide data on depth distribution in the GSL. Depth distribution of the same species may be different elsewhere (usually deeper) and relying only on Scott and Scott (1988) is a poor strategy given the availability of local data. Take lumpfish as an example. The present text makes it sound as it is rare in the GSL, citing 3 depths where it has been captured by commercial trawlers (outside of the GSL). Bourdages and Ouellet (2011) show that while not abundant, this species is not rare in the GSL but that it is found mostly outside the SEA update area, except in the northeastern portion.</p> <p>Bourdages H. & Ouellet J.F. 2011. Geographic distribution and abundance indices of marine fish in the northern Gulf of St. Lawrence (1990-2009). <i>Canadian Technical Report of Fisheries and Aquatic Sciences</i>, 2963, vi + 171 p.</p> <p>Nozères C., Archambault D., Chouinard P.-, Gauthier J., Miller R., Parent E., Schwab P., Savard L. & Dutil J.-D. 2010. Identification guide for marine fishes of the estuary and northern Gulf of St. Lawrence and sampling protocols used during trawl surveys between 2004 and 2008. <i>Canadian Technical Report of Fisheries and Aquatic Sciences</i> 2866, xi + 243 p.</p> <p>Capital H in <i>hippoglossoides</i>.</p> <p>Atlantic wolffish is not living on the slopes of the channels in the GSL. It is mostly found on the shelves (Dutil et al. 2011). It should be mentioned that its status if “of special concern” and that it will be discussed further on p. 181-182 and 275-276.</p> <p>Dutil J.D., Proulx S., Hurtubise S. & Gauthier J. 2011. Recent findings on the life history and catches of wolffish (<i>Anarhichas</i> sp.) in research surveys and in the sentinel fisheries and observer program for the estuary and gulf of St-Lawrence. <i>Canadian Science Advisory Secretariat Research</i></p>	<ul style="list-style-type: none">• Ordering of this information was required to best flow the available information.• Added four additional taxa from Bourdages and Ouellet 2011 as suggested,• Inserted text explaining that tables are in this section but additional distribution information is in the following section• Gave explanation on criteria chosen for finfish species tables; the tables represent more general distribution and habitat preferences; the distribution maps are meant to serve as a more detail Gulf-specific assessment• Made revisions concerning wolffish• Removed Atlantic halibut reference



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	<p><i>Document, 2010/126, x + 72.</i></p> <p>Atlantic wolffish is a threatened species. It should be said here, and there should be a cross-reference to p. 181-182 and 275-276.</p> <p>In habitat description for the Greenland halibut, a sentence is about the Atlantic halibut.</p>	
S133	\$4.2.1.4 Marine Fish (Invertebrate and Finfish Species), Table 4.34, pg 143 - Pertaining to the section dedicated to Roughnose Grenadier (<i>Trachyrhynchus murrayi</i>), this species is uncommon but not rare in multispecies Research Vessel (RV) surveys conducted by DFO NL Region in Subarea 2+3. The current description is no longer adequate.	<ul style="list-style-type: none"> Revised table and removed dated reference
S134	\$4.2.1.4 Marine Fish (Invertebrate and Finfish Species), Table 4.35, pg 145 - American eel is both a commercial and recreational species in Newfoundland. It should be added that mackerel can be found off Western Newfoundland from July to October.	<ul style="list-style-type: none"> Revised Table for eel and mackerel distribution
S135	\$4.2.1.4 Marine Fish (Invertebrate and Finfish Species), Table 4.36, pg 150 - American Lobster: what is referred to as spawning grounds for lobster (<i>some known spawning locations</i>) should rather be identified as the known areas of concentration of females, because females do not lay their eggs on the substrate, but they wear under their abdomen until they hatch.	<ul style="list-style-type: none"> Added footnote to the table explaining lobster life histories
S136	\$4.2.1.4 Marine Fish (Invertebrate and Finfish Species), Figure 4.30, pg 152 - The capelin spawning beach at Baker's Brook beach (see Table 4.36) is missing from this figure.	<ul style="list-style-type: none"> Figure revised to include Baker's Brook Beach
S137	\$4.2.1.4 Marine Fish (Invertebrate and Finfish Species), 1st sentence, pg 153 – With regard to Dufours not Dufors, the best reference to cite regarding overwintering of northern Gulf cod is Castonguay, M., C. Rollet, A. Fréchet, P. Gagnon, D. Gilbert, and J.-C. Brêthes. 1999. Distribution changes of Atlantic cod (<i>Gadus morhua</i>) in the northern Gulf of St. Lawrence in relation to an oceanic cooling. ICES J. Mar. Sci. 56: 333-344. Replace Murray et al. by Castonguay et al.	<ul style="list-style-type: none"> Cited suggested reference
S138	\$4.2.1.4 Marine Fish (Invertebrate and Finfish Species), pg 154 - Rainbow smelt are mentioned in the discussion of anadromous species but biological and ecological information is not included in Table 4.34. Sea Trout populations occur in the Study Area but are not mentioned in the SEA Update. They should also be included in Table 4.34.	<ul style="list-style-type: none"> Added these two species to finfish tables as well as four additional species from previous comment.
S139	\$4.2.1.4 Marine Fish (Invertebrate and Finfish Species), Figure 4.31, pg 155 - Replace "northern cod" with "northern Gulf cod" on the map legend. They are not the same stock.	<ul style="list-style-type: none"> Revised figure to remove reference to "northern cod" and clarified legend



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S140	§4.2.1.4 Marine Fish (Invertebrate and Finfish Species), Figure 4.31, pg 155 - The legend should include the yellow and green arrows as it is unclear what they represent in the figure.	<ul style="list-style-type: none"> Revised Figure to clarify legend
S141	§4.2.1.4 Marine Fish (Invertebrate and Finfish Species), Figure 4.32, pg 156 – This figure does not show the movement of Atlantic Salmon back to natal rivers in the SEA Update Area. There are a number of very important Salmon Rivers in the SEA Update Area and this information and the specific timing of the runs is available and should be included.	<ul style="list-style-type: none"> Figure was revised to clarify that salmon migrate through the SEA Area. Scheduled salmon river estuaries were also identified in the SEA Area. When supported with the text, the importance of the SEA Area to salmon (for feeding, migration, staging etc.) is clear. Providing the specific timing of the runs would complicate the presentation of spatial information. Furthermore, run-timing information may misrepresent sensitive times for salmon in marine areas as they are present in marine environments well before they are observed in freshwater counting facilities.
S142	§4.2.1.4 Marine Fish (Invertebrate and Finfish Species), pg 157 – There is no evidence that Lobster populations on the coast of Newfoundland or elsewhere in the Gulf are regulated by river run-off. DFO is not familiar with LaFontaine et al. 1991. This theory was popular regarding the Gulf in the 70s and 80s but has since been widely discredited. For lobster, variations in coastal temperature from wind stress and lately climate change as a long-term effect would be more relevant.	<ul style="list-style-type: none"> This reference was cited to show an example of how changing temperatures affect habitat distribution; used redfish example instead and revised text
S143	<p>§4.2.1.4 Marine Fish (Invertebrate and Finfish Species), Invasive Species, pgs 157-158 – This threat has not been acknowledged or further developed in Section 5. Discussing the potential for the spread of aquatic invasives should be an important planning consideration. Refer to the following reference for information on the potential impact of aquatic invasive species on NL environment due to ballast water exchange:</p> <p><i>McKenzie, C.H., Han, G., He, M., Wells, T., and Maillet, G. 2011. Alternate ballast exchange zones for the Newfoundland and Labrador Region – An aquatic invasive species risk assessment based on oceanographic modelling, ecologically and biologically significant areas and the sustainability of fisheries and aquaculture. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/087. viii + 39 p.</i> http://www.dfo-mpo.gc.ca/csas/publications/resdocs-docrech/2010/2010_087_e.pdf</p>	<ul style="list-style-type: none"> Added text in Section 4.2.1 that highlights potential implications of oil and gas activities on AIS distribution and introduction Also referenced further in Section 5.1

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<p>Distribution maps would be informative for this SEA Update. Consult the following webpage for additional information and distributions of these organisms in the SEA Update area: http://www.nfl.dfo-mpo.gc.ca/AIS-EAE</p>	
<p>S144 §4.2.1.5 Regional Marine Fish Distributions, pg 158 - State the reference period (survey years) for the tabled data in the caption.</p>	<ul style="list-style-type: none"> Added text throughout and in Figure titles (2004-2011)
<p>S145 §4.2.1.5 Regional Marine Fish Distributions, 3rd para., pg 159 - (1) Sea urchin: are the authors referring specifically to green sea urchin (<i>Strongylocentrotus droebachiensis</i>)? The associated figure shows presence of sea urchins in deep channel waters, but these would almost certainly be the deepsea heart urchin (<i>Brisaster fragilis</i>) which does not feed on kelp beds. (2) Why are sea urchins included here but not in Table 4.33?</p> <p>Last paragraph mentions that there is little information for snow crab abundance within the SEA update area. According to Chabot et al. (2007), the part of the SEA update area above 200 m is a major snow crab nursery (Fig. 55). Snow crab is stated to be generally found at depths ranging down to 380 m in the GSL. Again, see Fig. 3 in Sainte-Marie et al. 2005 which shows are sharp drop in frequency of occurrence deeper than 250 m. Indeed, trap fishing in the GSL occurs mostly in shallower depths.</p>	<ul style="list-style-type: none"> There was an error with this map and it has been revised Added new references and information therein regarding snow crab distribution in the SEA Update Area
<p>S146 §4.2.1.5 Regional Marine Fish Distributions, Finfish Species, 4th para., 3rd sentence, pg 163 – When, why and for how long do American Plaice migrate to deeper water along the slopes of the Laurentian Channel.</p>	<ul style="list-style-type: none"> Revised text to explain why they overwinter along the slopes
<p>S147 §4.2.1.5 Regional Marine Fish Distributions, pg 164 & Figure 4.38 - Atlantic cod. For this species there are more sources of data than the RV surveys (see Fréchet et al. 2009). In particular, Sentinel Fishery surveys show a relatively high abundance inshore (the RV surveys usually sample only waters > 50 m). Fréchet A., Gauthier J., Schwab P., Lambert Y., Le Bris A., Tournois C., Way M. & Collier F. 2009. The status of cod in the Northern Gulf of St. Lawrence (3Pn, 4RS) in 2008. <i>Canadian Science Advisory Secretariat Research Document</i>, 090, iv + 104 p.</p>	<ul style="list-style-type: none"> Reviewed references and revised text
<p>S148 §4.2.1.5 Regional Marine Fish Distributions, 1st para., pg 165 - “Atlantic Wolffish are somewhat more widespread in the Gulf than the other two wolfish species, and are generally found in the 200-m isobaths on the south slope of the Laurentian Channel (Dutil et al 2010b).” This is a misinterpretation of that source. The correct citation is “Atlantic wolffish are more widespread</p>	<ul style="list-style-type: none"> Revised text as suggested



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	<p>than the other two species, but clearly avoid the bottom of deep channels (Figure 8). Though in general their relative occurrence is low in the southern Gulf, they are present along the 200 m isobath on the slopes south of the Laurentian Channel.” p. 11. Thus the distribution along the 200 m isobaths is for the SGSL. Their Fig. 8 shows that the main area of distribution is the SEA update area. Figure 4.43 agrees with this. The text needs updating. NOTE: the publication year for this paper by Dutil is 2011, not 2010.</p> <p>Second paragraph – “<i>Spotted Wolffish</i> are known to occur in the northwest area of the Gulf, particularly in the Esquiman Channel (Dutil et al 2010).” Correct this to <u>northeast</u> area. And change 2010 to 2011.</p>	
S149	§4.2.1.5 Regional Marine Fish Distributions, Figures 4.36-4.48, pg 167-179 - The number of tows for each year of RV survey data included on the maps of fish distribution and abundance would assist in the interpretation of these figures. If the number of tows is similar from year to year then a map of the tow locations would also be helpful.	<ul style="list-style-type: none"> New Table with tow information and Figure with map of tow locations has been added
S150	§4.2.1.5 Regional Marine Fish Distributions, Figure 4.49, pg 180 - Many of the illustrated rivers are fragmented or incomplete. Can that be fixed. The base map used is a rather rudimentary illustration of the island of Newfoundland and cuts off many of the inner sections of bays along the west coast, notably Bonne Bay and the inner Bay of Islands, two of the most significant geographic features along the coast.	<ul style="list-style-type: none"> Figure showed extent of scheduled salmon rivers (as per the label / title), as mapped in DFO Anglers Guide. Revised Figure to address (mouths / estuaries shown)
S151	§4.2.1.6 Fish Species at Risk, pg 181 - The correct description of “special concern” is “A species that may become a threatened or endangered species because of a combination of biological characteristics and identified threats”.	<ul style="list-style-type: none"> Added text as suggested
S152	§4.2.1.6 Fish Species at Risk, pg 182 - Northern wolffish as threatened species. Rarely seen in the GSL, but most occurrences were within the SEA Update Area (Dutil et al. 2010, Fig. 6). Text suggests that the spotted wolffish and the Atlantic wolffish are common through the SEA Update Area, citing Dutil et al. (2010). It fails to mention that the SEA Update Area is the most important habitat for these two species, and even for the third species (Northern wolffish) according to Dutil et al. 2011 (see Fig. 6, 7, 8, 10, 11, 12, 17, 18, 19).	<ul style="list-style-type: none"> Revised text as suggested



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S153	<p>\$4.2.1.6 Fish Species at Risk, pg 182 -All three species of wolffish were reassessed by COSEWIC in November 2012. Their recommended statuses have not changed. This should be noted in the text. Also see Section 5.1.3.1.</p> <p>Kulka 2007 is a combined Recovery Strategy/Management Plan for all three species of wolffish, not just a “recovery strategy” as indicated in the text.</p> <p>Regarding critical habitat the SEA Update states “<i>Critical habitat under the SARA is defined as habitat that is required for the species’ survival or recovery.</i>” It should be noted SARA requires protection of critical habitat.</p>	<ul style="list-style-type: none"> Revised text as suggested citing new references.
S154	<p>\$4.2.1.6 Fish Species at Risk, pgs 182-183 - There is an inconsistency between the text in the third paragraph on page 182 “There are currently four marine fish species...” and the accompanying Table 4.40. To avoid confusion, either keep the text and table consistent, or explain why the Banded Killifish has not been discussed as a Species at Risk (SAR) when it appears in the table under a species of concern (page 183). Table 4.40 is referenced throughout the text elsewhere without explanation of the exclusion of this species of concern. (Similar inconsistencies were noticed in section 4.2.3.6).</p>	<ul style="list-style-type: none"> Provided explanation of why Killifish is included in tables but not in text
S155	<p>\$4.2.1.6 Fish Species at Risk, Table 4.40, pg 183 - Although the Bonne Bay special concern population of Acadian redfish is included in the table, the threatened population of Acadian redfish is not included.</p>	<ul style="list-style-type: none"> Added threatened population of Acadian redfish
S156	<p>\$4.2.1.6 Fish Species at Risk, Table 4.40, pg 183-184 -The following corrections should be made to Table 4.40 based on information from the SAR Registry:</p> <ul style="list-style-type: none"> There is no Northwest Atlantic population of Atlantic Sturgeon, the correct population is the St. Lawrence Population; There is only one population of Atlantic Wolffish which occurs in the Atlantic Ocean, therefore the row containing Atlantic Wolffish occurring in Nova Scotia should be removed; Cusk was reassessed by COSEWIC in 2012 and was designated as endangered; and The COSEWIC designation for the Atlantic population of Striped Bass should be Special Concern. 	<ul style="list-style-type: none"> Addressed these comments by revising table as suggested

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S157	<p>\$4.2.1.7 Identified Important and Sensitive Areas for Fish and Fish Habitat, pgs 185-191 –On page 185, the report states: “...Whether in the Esquimaux Channel or in shallower waters, western Newfoundland remains a main concentration area for juvenile Atlantic cod, redfish, American plaice and Atlantic wolffish...”.</p> <p>It is also a main concentration area for skate juveniles (Table 9 in Savenkoff et al., 2007). Savenkoff, C., M.-N. Bourassa, D. Baril, and H.P. Benoît. 2007. <i>Identification of ecologically and biologically significant areas for the Estuary and Gulf of St. Lawrence. DFO Canadian Science Advisory Secretariat Research Document, 2007/015.</i></p> <p><u>Lobster Areas</u></p> <p>Lobster areas were identified as sensitive areas in the “roll up” summary of key results and findings of the SEA consultation program. P. 58 of the Consultation Report notes:</p> <p><i>“The presence of various species at risk in and adjacent to the SEA Update Area, as well as protected and particularly sensitive areas and times (e.g. national parks, bays, bird colonies, lobster areas, krill and other food sources).”</i></p> <p>The following lobster areas were identified at consultations but are not referred to on p. 191 of the SEA update as sensitive areas:</p> <ul style="list-style-type: none"> Port aux Basques Open House – Consultation Report p. 13 <i>“...Information was provided about the location of some important lobster areas in the region, including sites near Ramea, Port aux Basques and east, as well as north to Bay St. George...”</i> Rocky Harbour Open House – Consultation Report p. 24 <i>“There are very rich fishing grounds in the areas covered by the existing exploration licences off Western Newfoundland. Sally’s Cove, for example, is one of the best lobster grounds along the coast...”</i> 	<ul style="list-style-type: none"> Added skate juveniles as a species with main concentration Important lobster areas have been added to this section Section on importance of eelgrass beds has been added Background information on Atlases has been added to Section 4.2.1.1 Information on the Atlases of Significant Coastal and Marine Areas in Western Newfoundland has been added in Section 4.2.1.1 and this information and its utility is then referenced throughout the SEA Update. The Atlases themselves were accessed and reviewed. They include a series of 1: 75,000 scale NTS maps; 10 for West Coast, 14 for the Great North Peninsula, and five for Southern Labrador (the index maps for both Atlases are illustrated in Figure 4.27). The scale of this information (1: 75,000) is too fine and detailed to be reproduced here, and as of the time of writing was not available in GIS mapping file formats, The SEA Update Report does, however, identify and describe these, and notes that “these Atlases comprise a useful and valuable resource for planning and analysis at the local scale, such as in the design and/or EA of individual projects”.



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<p><i>"...Important lobster grounds are located off Sally's Cove and between Rocky Harbour and Cow Head..."</i></p> <p>The importance and sensitivity of lobster was highlighted by the FFAW at the October 1 Holiday Inn session. Pp. 18-19 of the Consultation Report states:</p> <p><i>"Crab, lobster and cod are important species economically that need to be protected. They are the backbone of the fishery right now...Lobster are especially sensitive to human activities, as it is the near shore environment in which they live and where fishing occurs..."</i></p> <p>The Atlases of Significant Coastal and Marine Areas discussed later also depict important lobster areas and lobster sanctuaries (ex. St. John Bay, Cow Head Harbour and Shallow Bay, etc.). Therefore, the information on sensitive lobster areas provided via consultations and depicted in the Atlases of Significant Coastal and Marine Areas should be included on p. 191 as well as in section 5.1.3.2.</p> <p><u>Eelgrass Beds</u></p> <p>Eelgrass has been identified by Fisheries and Oceans Canada as an Ecologically Significant Species. This significance is evident in quotes from DFO. 2009. Does eelgrass (<i>Zostera marina</i>) meet the criteria as an ecologically significant species? DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/018. http://www.dfo-mpo.gc.ca/CSAS/CSAS/Publications/SARAS/2009/2009_018_e.pdf.</p> <p><i>"...Eelgrass meadows have extremely high levels of primary production, ranking among the most productive ecosystems on the planet..."</i></p> <p><i>"...Eelgrass can serve as important spawning and nursery habitat..."</i></p> <p><i>"...Based on these considerations, it is concluded that eelgrass (<i>Zostera marina</i>) in eastern Canada has characteristics which meet the criteria of an Ecologically Significant Species. As such, if the</i></p>	

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<p><i>species were to be perturbed severely, the ecological consequences would be substantially greater than an equal perturbation of most other species associated with this community. Based on current knowledge, eelgrass, where it presently exists, can have controlling influence over key aspects of the nearshore marine ecosystem structure and function...</i></p> <p>The document also notes the presence of eelgrass beds along the west coast of Newfoundland.</p> <p><i>"There are no estimates of areal coverage in Newfoundland, except in a small number of individual embayments (e.g. Newman Sound). There are several large beds on the west coast of the island..."</i></p> <p>The location of eelgrass beds along the west coast is depicted in the Atlases of Significant Coastal and Marine Areas discussed later and eelgrass beds were recognized as Sensitive Areas in the Environmental Assessment of the Ptarmigan Geophysical Program 2012-2021 Offshore Western Newfoundland. A quote from that EA document indicates:</p> <p><i>"...In the case of an accidental event resulting in the release of marine diesel fuel or streamer fluid, sensitive areas within the Study Area, such as eelgrass beds may be affected..."</i></p> <p>Therefore, eelgrass beds should be included as Important and Sensitive Areas for Fish and Fish Habitat and information on their location be included in the SEA update document.</p> <p><u>Atlases of Significant Coastal and Marine Areas in Western Newfoundland</u></p> <p>As part of integrated management planning efforts on Newfoundland's west coast, two Atlases of Significant Coastal and Marine Areas have been developed by the Bay St. George/Port aux Port Peninsula Marine and Coastal Resources Steering Committee and the Great Northern Peninsula Integrated Coastal Zone Management (ICZM) Steering Committee for their Coastal Management Areas (CMAs).</p> <p>Bay St. George/Port aux Port Peninsula (Atlas covers Cape Ray to Serpentine River) http://www.longrange.ca/pdf/bsgpap.pdf</p> <p>Great Northern Peninsula (Atlas covers Cape St. Gregory to Cape Bauld on the Island of</p>	



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<p>Newfoundland and from the Quebec/Labrador border to Cape St. Charles in southern Labrador) http://coastalplanningnp.ca/GNP_SL_Significant Coastal and Marine Areas Atlas.pdf</p> <p>The introductions of the Atlases note they are “...a collection of local knowledge that identifies important ecological, natural and historic features along the coastal and marine areas...to catalogue and share local knowledge, and to create awareness of this (these) important coastal and marine area(s)...” The Atlases “...can be used together with other spatial planning and research tools to support sustainable economic planning, coastal development processes, stewardship and conservation efforts, environmental response preparedness, <u>environmental assessment processes</u> and other coastal interests...”</p> <p>The Atlases include visual representations of several areas that would be deemed sensitive areas according to the Sensitive Areas definition outlined in the Strategic Environmental Assessment Update Western Newfoundland and Labrador Offshore Area Scoping Document</p> <p>“...An area known to have particular ecological or cultural importance and is not captured under federal or provincial regulatory frameworks (e.g., corals, spawning, nursery, rearing, or migratory areas; areas of high productivity, rare or unique habitats; Important Bird Areas (IBAs); Ecologically and Biologically Significant Areas (EBSAs); areas of traditional harvesting activities...”</p> <p>Therefore, the SEA Update document should make reference to these Atlases and relevant information therein (in this section and other appropriate sections – (e.g. 4.2.2.6, 5.1.3.2, 5.1.5, 5.2.3.2, 5.2.5, 5.3.3.2, 5.4) and indicate that they provide an extensive catalogue and visual representation of ecological, natural and historic features including spawning and staging areas for marine fish species such as lobster, herring, capelin and salmon; staging and nesting areas for migrating waterfowl and shorebirds; coastal habitat such as eelgrass, estuaries and beaches; sightings of marine mammals; and local knowledge of historic shipwrecks and archaeological sites. Each Atlas map is “followed by a table that provides additional information about individual features including descriptive information, location, time of occurrence, as well as human and environmental activities occurring within these areas...”</p> <p>The Codroy Valley – Bay St. George – Port aux Port Atlas was recently referenced in the</p>	



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	Environmental Assessment of the Ptarmigan Geophysical Program 2012-2021 Offshore Western Newfoundland.	
S158	§4.2.1.7 Identified Important and Sensitive Areas for Fish and Fish Habitat, Table 4.41, pgs 186-188 – Many locations discussed in tables, would be useful if identified on a map or at minimum their jurisdiction identified (i.e. province).	<ul style="list-style-type: none"> Added provinces to table
S159	§4.2.1.7 Identified Important and Sensitive Areas for Fish and Fish Habitat, pgs 188-190 & §4.3.6.3 Marine Protected Areas, pg 256-258 - The report does not refer to the study currently under way on the establishment of a Marine Protected Area around the Îles de la Madeleine (Magdalen Islands). This information should be added to pages 188-190 and 257-258 of the report. http://etudeairemarineim.ca/en/index.htm < http://etudeairemarineim.ca/en/index.htm >	<ul style="list-style-type: none"> Added text referencing the Magdalen Islands MPA study in the new “Protected Areas” section of the report
S160	§4.2.1.7 Identified Important and Sensitive Areas for Fish and Fish Habitat – Marine Protected Areas (MPAs)/Areas of Interest (AOI), pg. 189 – Use bullets rather than numbers for the AOIs, as the numbers are different from the ones indicated on Figure 4.50	<ul style="list-style-type: none"> Changed numbers to bullets
S161	§4.2.1.7 Identified Important and Sensitive Areas for Fish and Fish Habitat – Marine Protected Areas (MPAs)/Areas of Interest (AOI), Figure 4.50, pg 190 - This figure should be the general one for protected/sensitive areas, within the new Protected Areas section referred to below. Add National Parks and NMCA's, Migratory Bird Sanctuaries, IBAs (which are mentioned and mapped only for the SEA Update Area in Section 4.2.2.6, pg 210-212.), etc to figure (or have a few if gets too crowded). Use a map at scale of Gulf (i.e. scale of 4.18) as indicated in general comments. Include Magdalen Island MPA study area as well.	<ul style="list-style-type: none"> Figures created / moved and added as requested (Section 4.2.4 – Protected Areas) Added text referencing the Magdalen Islands MPA study (not included on map to avoid confusion - As the Figure shows existing and formally designated MPAs etc)
S162	§4.2.1.7 Identified Important and Sensitive Areas for Fish and Fish Habitat – Marine Protected Areas (MPAs)/Areas of Interest (AOI), para 1, pg 191 - Disagree with the logic suggesting that shorebirds and waterfowl are less important than seabirds so deserve less attention in the SEA; in the event of a spill both waterfowl and shorebirds, which are largely or entirely restricted to near-shore habitats, will be extremely vulnerable to high mortality and long term habitat degradation. They may also be vulnerable to mortality at onshore to offshore drill sites (e.g. due to flares or containment ponds). Consequently coverage of both groups should be expanded beyond the cursory coverage presented in the draft.	<ul style="list-style-type: none"> Noted. Coverage of waterfowl and shorebirds has been expanded in this draft (sections 4.2.2.2 and 4.2.2.3).
S163	§4.2.1.7 Identified Important and Sensitive Areas for Fish and Fish Habitat, Other Identified	<ul style="list-style-type: none"> Edited as noted



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Important Areas for Fish and Fish Habitat, last para., line 1, pg 191 – Should it be Green “Point” Banks?		
S164	§4.2.1.7 Identified Important and Sensitive Areas for Fish and Fish Habitat, Other Identified Important Areas for Fish and Fish Habitat, pg 191 – – In addition, some of the identified sites important for lobster in section 4.2.1.4, North Head and Trout River Bay, are not identified.	<ul style="list-style-type: none"> Figure has been updated to address (and moved, see later comments)
S165	§4.2.2 Marine Birds, pg 192 - Passerines should be discussed in this section, particularly concerns for attraction to light and flares during foggy conditions and inclement weather.	<ul style="list-style-type: none"> A section on landbirds (including passerines) has been added (Section 4.2.2.4)
S166	§4.2.2.1 Seabirds, Figures 4.51 – 4.54, pgs 192-196 - Units should be added to the figure legends of these figures and elsewhere throughout the document.	<ul style="list-style-type: none"> Units (birds/linear km) have been added to these Figures.
S167	§4.2.2.1 Seabirds, pg 192 - Gjerdrum et al. 2008 should instead be Gjerdrum et al. 2012 throughout the document.	<ul style="list-style-type: none"> The reference is correct here—We are referring to the results of the ECSAS monitoring summarized in the 2008 report. The 2012 report (which is referenced elsewhere in the section) contains the monitoring protocol.
S168	§4.2.2.1 Seabirds, Figure 4.55, pg 197 – The title “CWS May to August Atlantic Zone Monitoring Surveys Conducted in the SEA Update Area” should be “CWS May to August Eastern Canada Seabirds at Sea surveys...”. The surveys discussed in this section consisted of others in addition to the Atlantic Zone Monitoring Surveys.	<ul style="list-style-type: none"> Figure title has been changed.
S169	§4.2.2.1 Seabirds, Cormorants, pg 198 – “From aerial surveys of Western Newfoundland...CWS survey data).” These sentences should be re-worded as follows: “From aerial surveys of Western Newfoundland (CWS, unpubl. data) and ground surveys within Gros Morne National Park (S. Gerrow, Parks Canada, unpubl. data), two colonies of up to 100 breeding pairs and three colonies of up to 500 breeding pairs of cormorants are known to be within the SEA Update Area (Table 4.53). While Double-crested Cormorants have a wide distribution in Newfoundland, the breeding range of Great Cormorants is restricted to the south and southwest coast of the island (Cairns et al. 1989).” Reference: Cairns, D. K., W. A. Montevecchi, and W. Threlfall. 1989. Researcher's guide to Newfoundland seabird colonies. 2nd ed. Memorial Univ. of Newfoundland Occas. Pap. Biol. no. 14. Memorial University of Newfoundland, St. John's.	<ul style="list-style-type: none"> Sentence has been re-worded, and reference has been added.
S170	§4.2.2.1 Seabirds, Cormorants, pg 199 – Delete the following sentence: “Cormorant populations are most sensitive to perturbation in the SEA Update Area when they are most abundant.”	<ul style="list-style-type: none"> Deleted sentence.



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S171	\$4.2.2.1 Seabirds, Gulls, pg 202 - There are insufficient data to estimate Sabine's gull population trends. Glaucous gulls are in global decline and are known to occur in the western Newfoundland offshore area. Regional data concerning Glaucous gulls are sparse, but it is likely that this species is in decline in the SEA area as well. Further research is required.	<ul style="list-style-type: none"> Information has been added to the table as well as the text below.
S172	\$4.2.2.1 Seabirds, Terns, pg 202 - Caspian Terns are a locally uncommon species, and within the SEA Update Area are believed to breed only at Stephenville Crossing and in Gros Morne National Park.	<ul style="list-style-type: none"> Noted and changed; also added information from Parks Canada submission.
S173	\$4.2.2.1 Seabirds, Table 4.50, pg 205 - Reproduction row - Most shearwaters are burrow nesters; fulmars nest on cliffs.	<ul style="list-style-type: none"> Noted and changed.
S174	\$4.2.2.1 Seabirds, last sentence of paragraph below Table 4.50, pg 205 - This statement may be only partially accurate, as shearwaters can be strongly attracted to artificial light so may be vulnerable to flaring etc..	<ul style="list-style-type: none"> The statement has been reworded: "Because they are locally relatively sparse, their populations are also not considered particularly vulnerable to the effects of offshore activity in the SEA Update Area, although shearwaters are known to be strongly attracted to artificial light sources including flaring (Weise et al. 2001)."
S175	\$4.2.2.2 Coastal Waterfowl, para 1, pg 207 - Barrow's Goldeneye also winter in Rocky Harbour annually and at least occasionally at Western Brook, St Pauls Bay, Cow Head / Shallow Bay, and Portland Creek (see PCA submission).	<ul style="list-style-type: none"> Added information from Parks Canada 2012 submission.
S176	\$4.2.2.3 Shorebirds, para 1, pg 207 - Shallow Bay and Western Brook Beach (also both in GMNP) are also notable shorebird sites in western Newfoundland, and are at least as important as some of the other listed sites.	<ul style="list-style-type: none"> Added these two sites to the paragraph.
S177	\$4.2.2.3 Shorebirds, pg 207 – It should be noted here that Purple Sandpipers winter in this area, and are present from November to April along rocky shorelines and offshore ledges and islands. This species utilizes high wave action areas to forage at low tide, preying on small mollusks and other marine life that shelter in the seaweed. It should also be noted that although Newfoundland does not host a high proportion of all fall migrating shorebirds along the Atlantic Flyway, the west coast of Newfoundland hosts the greatest proportion of migrating shorebirds within the province, particularly for species such as the White-rumped Sandpiper and the Semipalmated Sandpiper.	<ul style="list-style-type: none"> Added a new paragraph at the end re. Purple Sandpiper use of the area in winter. Added sentence about the provincial importance of Western Newfoundland to the first paragraph of this section.



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S178	§4.2.2.4 Bird Species at Risk, 1st para. , pg 207 - Add Buff-breasted Sandpiper to the numbered list of species.	<ul style="list-style-type: none"> • Buff-breasted Sandpiper has been added to the numbered list and to the bullet list below, with information from Parks Canada (2012). • Also added Peregrine Falcon, Short-eared Owl and Bank Swallow in accordance with Parks Canada information.
S179	<p>§4.2.2.4 Bird Species at Risk, pg 207 – The final version of the Piping Plover Recovery Strategy is posted at www.sararegistry.gc.ca, and should be used in lieu of the draft version referred to in this document.</p> <p>The Piping Plover also nests on the Magdalen Islands, where approximately 40 pairs are present each year. It is important to note that provincial authorities have identified critical habitats for this species and that they will be legally protected under the Québec provincial <i>Conservation et mise en valeur de la faune</i> act in the near future.</p>	<ul style="list-style-type: none"> • Noted. All references to the PIPL recovery strategy are to the final version. Information on plovers nesting on the Magdalen Islands has been added to the bullet.
S180	§4.2.2.4 Bird Species at Risk, pg 207 - Several designated critical habitat beaches occur in the WNLOA including Shallow Bay and (in future) Western Brook Beach in GMNP. A map of these beaches should be included.	<ul style="list-style-type: none"> • Have mentioned the critical habitat beaches in GMNP in the bulleted list. • A map of the beaches has also been developed and added
S181	§4.2.2.4 Bird Species at Risk, 1st bullet, pg 208 - This "small" moulting concentration is the largest such concentration in Newfoundland.	<ul style="list-style-type: none"> • Text has been changed to reflect this.
S182	§4.2.2.4 Bird Species at Risk, 2nd bullet, pg 208 - Barrow's Goldeneye also winter in Rocky Harbour annually and at least occasionally at Western Brook, St Pauls Bay, Cow Head / Shallow Bay, and Portland Creek (see PCA submission).	<ul style="list-style-type: none"> • Noted and updated with Parks Canada information.
S183	§4.2.2.4 Bird Species at Risk, 4th bullet, pg 208 - Shallow Bay (GMNP) is another important Red Knot stopover location, possibly the most important stopover in Newfoundland (see PCA submission)	<ul style="list-style-type: none"> • Noted and updated with Parks Canada information.
S184	§4.2.2.6 Significant Bird Habitat Areas Including IBAs, pg 210 - A section concerning Black-legged Kittiwake should be added here. Kittiwakes are abundant on the northeast coast and eastern Newfoundland. However, on the west coast of Newfoundland, this species is concentrated in five colonies located within the Port-au-Port area. This restricted distribution merits further discussion in this section.	<ul style="list-style-type: none"> • Added mention of Black-legged Kittiwake under "Locally Rare Species" (4.2.2.5) as well as under significant bird habitat section. • Added a mention of the proposed NMCA and the designated wildlife habitats on the Magdalen



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	<p>There should be mention of the proposed National Marine Conservation Area around the Magdalen Islands. NMCA are under <i>Canada's National Parks Act</i>. Please consult M. Nelson Boisvert with Parks Canada (nelson.boisvert@pc.gc.ca; 418-649-8213) to obtain more information on this proposed protected area (e.g., maps).</p> <p>There are many provincially protected wildlife habitats (designated under the <i>Conservation et mise en valeur de la faune act</i>) on the Magdalen Islands, some of which are included in the different IBA's, NWA's or MBS :</p> <ul style="list-style-type: none"> • Aire de concentration d'oiseaux aquatiques de l'Île de l'Est • Refuge faunique de la Pointe-de-l'Est • Colonie d'oiseaux sur une île ou une presque île de l'étang de l'Est # 2, # 3 • Colonie d'oiseaux sur une île ou une presque île de l'Île Shag (Havre-aux-Maisons) • Colonie d'oiseaux sur une île ou une presque île de l'Île Rouge, Havre-Aux-Maisons • Colonie d'oiseaux en falaise de l'Île aux Goélards, Étang-du-Nord • Aire de concentration d'oiseaux aquatiques de la Plage de l'ouest #2 20-12-04 • Aire de concentration d'oiseaux aquatiques de la Plage de l'Ouest # 1 20-12-03 • Colonie d'oiseaux en falaise du Sud du Havre-Aux-Basques # 3-Colonie 2D • Colonie d'oiseaux sur une île ou une presque île du Sud du Havre-Aux-Basques # 1, # 2 <p>Please contact the Ministère des Ressources naturelles et de la Faune du Québec for more information (e.g., geo-referenced maps) : services.clientele@mrnf.gouv.qc.ca.</p>	Islands.
S185	<p>\$4.2.2.6 Significant Bird Habitat Areas Including IBAs - Gros Morne National Park IBA, pg 211 -</p> <p>Should read "Belldowns Island", not White Rocks. Also, these islands are important breeding areas for Common Eider, Black-legged Kittiwakes, and large gulls and cormorants. Large shorebird aggregations also occur at Shallow Bay and Western Brook Beach. Shallow bay and (in future) Western Brook Beach are Piping Plover Critical Habitat, and Shallow Bay is also important for Red Knot. The GMNP coast is also important for wintering waterfowl, especially black duck and common goldeneye.</p>	<ul style="list-style-type: none"> • The discussion on GMNP IBA has been updated with this information.
S186	<p>\$4.2.2.6 Significant Bird Habitat Areas Including IBAs - Other Important Habitat Areas, 2nd para, pg 211 - The list of gazetted piping plover critical habitat beaches is in the recovery strategy and is published on the SARA registry, and should be included as a figure.</p>	<ul style="list-style-type: none"> • A new Figure showing piping plover habitat beaches has been created.



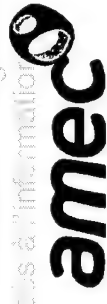
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S187	<p>§4.2.2.7 Seasonal Considerations for Marine Birds, pg 213 - “Many species of shorebirds, including the endangered Red Knot, utilize coastal habitats such as sandy mudflats in Western Newfoundland during their southward migration, with peak abundance occurring in late July to September.”</p> <p>The dates for the above quote should be changed from July to September into July to October.</p> <p>Shorebirds utilize but are not limited to sandy mudflats, which they only typically use at low tide for feeding. Shorebirds are also often found in saltmarshes, river outlets (including those with rocky bottoms) and various high tide roost sites.</p> <p>The section on winter months should include a note on occurrence of Purple Sandpiper. For example, 200 Purple Sandpipers were recently reported within Gros Morne National Park.</p>	<ul style="list-style-type: none"> Noted. The section has been updated with this information.
S188	<p>§4.2.2.7 Seasonal Considerations for Marine Birds, Table 4.53, pgs 214-219 - Data should be referenced for this table. Based on what is shown in this table, it seems likely that 2002 data has been used to construct it. An aerial survey of seabird colonies was conducted by EC-CWS in 2006 and 2007 for most of the SEA Update Area, and the results show that some previously-surveyed colonies are missing, and that the sizes of existing colonies have changed (see spreadsheet and map attached). Please incorporate the attached data into this table. Also, Parks Canada has updated information for seabirds breeding within and just outside Gros Morne National Park. Parks Canada should be contacted for this information.</p>	<ul style="list-style-type: none"> Data from CWS 2006-07 surveys and from the Parks Canada submission have been added to the Table
S189	<p>§4.2.2.7 Seasonal Considerations for Marine Birds, Table 4.53, pgs 216 & 217 - See the Parks Canada submission for accurate numbers of each species of seabird nesting on Western, Middle, Little, Stearin, and Belldowns Islands (these ones are pretty far off and the species list is incomplete / inaccurate for each one).</p>	<ul style="list-style-type: none"> Data from CWS 2006-07 surveys and from the Parks Canada submission have been added to the Table
S190	<p>§4.2.3 Marine Mammals and Sea Turtles, pg 220 - The report should note that there are two areas important for marine mammals including a co-occurrence of several marine mammals for feeding including deep-divers and blue whale (listed as endangered under the Canadian Species at Risk Act in 2005; northwest Atlantic population), in winter (ice-free area) in the area of interest (IA#6 and IA#8 identified in the “pinnipeds and cetaceans” layer; see Table 10 in Savenkoff et al., 2007).</p> <p><i>Savenkoff, C., M.-N. Bourassa, D. Baril, and H.P. Benoit. 2007. Identification of ecologically and</i></p>	<ul style="list-style-type: none"> Noted. A new subsection on important habitats for marine mammals and sea turtles has been added.



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	<i>biologically significant areas for the Estuary and Gulf of St. Lawrence. DFO Canadian Science Advisory Secretariat Research Document, 2007/015.</i>	
S191	\$4.2.3 Marine Mammals and Sea Turtles, pg 220 - There are 9 species that are reported to occur in western Newfoundland, and a similar number in the Georges Bay area. The information presented in this section, including the summary tables for each species should be reviewed to reflect the available data (Lesage et al. 2007).	<ul style="list-style-type: none"> Lesage et al. (2007) was cited throughout this section; however, further information from this report is included in the species accounts where available.
S192	\$4.2.3.1 Mysticetes, Table 4.56, pg 221 - As indicated in Lesage et al. (2007) and cited above for other species, blue whales occur seasonally in western Newfoundland, both in the St Georges Bay area and along the western shelf of Newfoundland. This should be acknowledged in the SEA as this species is Endangered under the SARA.	<ul style="list-style-type: none"> This is stated in the text below the table.
S193	\$4.2.3.2 Odontocetes, pg 225 - The information that DFO and Memorial University of Newfoundland researchers have sighted Sperm Whales many times in shallow water, and close to the coastline in southern Newfoundland and occasionally in similar situations on the southwest and west coasts of Newfoundland should be added.	<ul style="list-style-type: none"> Noted; this information has been added in the sperm whale text below the summary table.
S194	\$4.2.3.2 Odontocetes, pg 226 – It should noted that a National Defence Reconnaissance aircraft recorded video of a group of more than 100 Beluga Whales swimming southwards near the coast off Port aux Port in the winter last year. It is possible that Beluga Whales could be seen in this area during any time of year.	<ul style="list-style-type: none"> Noted; this information has been added in the text below the summary table.
S195	\$4.2.3.5 Sea Turtles, pg 232 - Leatherback turtles use the area east of Cape Breton, including the Laurentian Channel heavily during the summer months (DFO 2011). Given that seismic activity on the Newfoundland side of the Laurentian Channel might affect turtles in proximity on the other side, the potential occurrence of turtles in southwestern Nfld and within the SEA Update Area should be acknowledged.	<ul style="list-style-type: none"> Noted. This has been added to the text.
S196	\$4.2.3.6 Marine Mammal and Sea Turtle Species at Risk, Pg. 233 – When referring to federally listed species, the population should also be identified. Humpback Whale, Killer Whale (orca) and Loggerhead Turtle are not federally listed. This should be corrected in this section as well as Section 5.3.3.1 (Page 294).	<ul style="list-style-type: none"> Species that are listed by COSEWIC but not under SARA have been identified as such in the text. Populations for federally listed species have been added here and in Sec 5.3.3.1.
S197	\$4.2.3.6 Marine Mammal and Sea Turtle Species at Risk, Pg. 233 – Leatherback sea turtle is known to frequent areas in the gulf, along the tip of the Gaspé Peninsula, near Îles-de-la-Madeleine and along the north shore	<ul style="list-style-type: none"> This has been added to the text under the Sea Turtles summary table (Sec 4.3.2.5)



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S198	<p>§4.2.3.6 Marine Mammal and Sea Turtle Species at Risk, Figure 4.57, Pg. 234—Indicate the source of the data for figure 4.57.</p> <p>Instead of a map (Figure 4.57) illustrating the observations of marine mammals (MM) and turtles of seas in the form of scattered points, this section should rather present a map showing important areas for the MM and the turtles.</p> <p>The map of areas of ecological and biological interest for MM established by Lesage et al. 2007 for example, previously cited in the SEA could be used. This would be a more accurate depiction of the importance of the SEA area to MM.</p> <p>This subsection should also present a mapping synthesis of the critical habitat of species at risk, or at least of their main components extracted from listed species recovery plans.</p>	<ul style="list-style-type: none"> • A new subsection, “ Identified Important Areas for Marine Mammals and Sea Turtles,” has been added. • This section discusses critical habitat for SAR, as well as the ecologically significant areas for Marine Mammals from Lesage et al. 2007. • The figure illustrating marine mammals and sea turtle observations has been amended to include important areas for the species (as identified in Lesage et al. 2007).
S199	<p>§4.2.3.6 Marine Mammal and Sea Turtle Species at Risk, Table 4.70, Pg. 235 – Humpback Whale should not be included in this table. The Species at Risk Public Registry shows the species at Schedule 3 Special Concern, however this is not their current status. COSEWIC has been assessing this species since 1977. In October 1999 COSEWIC adopted new assessment criteria. When SARA was proclaimed, only those species that had been assessed according to these new criteria were included on Schedule 1. To ensure that the remaining species at risk would be re-assessed within an appropriate timeframe, they were all included in SARA with the addition of <u>Schedule 2</u> and Schedule 3. The Humpback Whale has since been reassessed and determined to be not at risk under SARA.</p> <p>The correct common name for orca is Killer Whale.</p>	<ul style="list-style-type: none"> • Noted. Humpback whale has been removed from the table. • The common name Orca has been changed to Killer Whale throughout the text.



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S200	<p>Page 236 – new section “Protected and Sensitive Areas” (either a new 4.2.4 under “Biological Environment” or new 4.3, with current section 4.3 “Human Activities” becoming 4.4)</p> <ul style="list-style-type: none">Combine the information and figures/tables from 4.2.1.7, 4.3.6.2 and 4.3.6.3 into this new section (corrected as per specific comments below), including the NMCA information which is certainly not particularly relevant to fish, as well as the MPA/AOI info.Ensure all areas mentioned are mapped, preferably on a Gulf scale map such as scale used for Figure 4.18.Corrections to be made to content of 4.2.1.7 that would move to new 4.2.4 or 4.3:In MPAs/AOI section, to be placed in new section: “Canada’s <i>Oceans Act</i> mandates ... on behalf of the Government of Canada, as well as establish Marine Protected Areas under the <i>Oceans Act</i>.... “An <i>Oceans Act</i> Marine Protected Area (MPA) is a protective designation...” [to avoid confusion with use of generic MPA term].Place NMCA information in new section and replace with the following: <p>“Parks Canada establishes National Marine Conservation Areas (NMCAs) under the <i>Canada National Marine Conservation Areas Act</i>. NMCAs are marine areas managed for ecologically sustainable use and containing smaller zones of protection. They include the seabed, the water column above it and they may also take in wetlands, estuaries, islands and other coastal lands.</p> <p>Oil and gas exploration and development is prohibited within NMCAs. No NMCAs have been established in the SEA Update Area.</p> <p>Parks Canada is charged with setting up a national system of marine protected areas, under the National Marine Conservation Areas Program, to represent each of the 29 marine regions found in Canada’s Atlantic, Arctic and Pacific Oceans, and the Great Lakes.</p> <p>Only one of Parks Canada’s marine regions is within the SEA Update Area: the Laurentian Channel marine region. However, the Gulf of St. Lawrence encompasses three additional regions. The status of Parks Canada NMCA initiatives in these regions is described below and illustrated on figure xx:</p> <ul style="list-style-type: none">Established in 1998, the Saguenay-St. Lawrence Marine Park is the only designated protected area under the NMCA program within the Gulf of St. Lawrence, and represents the St.	<ul style="list-style-type: none">New section created, as requested, called “Protected Areas” (Section 4.2.4), with relevant Figures created and added hereInformation on protected areas (designated and proposed) has been moved here, and additional information added as per specific comments. This includes MPAs, AOI, NMCAs etc etcInformation on Identified “sensitive areas” from a biophysical perspective (such as fish spawning areas, etc) are still discussed in their respective chapters (fish and fish habitat etc), as they are a key component of these biophysical VECs (esp in Chapter 5), but as these come before the new “Protected and Sensitive Areas” section they are also discussed / x-referenced there as well.This approach and structure was required, as identified sensitive areas for fish, birds etc are assessed as part of these VECs in Ch 5 (and thus, to maintain a consistent format and structure between Chs 4 and 5).Please have a look at current proposed structure and advise if okText updated as noted.



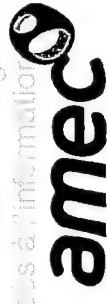
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<p>Lawrence Estuary marine region.</p> <ul style="list-style-type: none"> • Announced in 2010, a joint Canada/Quebec feasibility assessment is presently underway for a marine protected area surrounding the îles de la Madeleine in the southern Gulf of St. Lawrence (Magdalen Shallows marine region). • The South Coast Fjords NMCA study area, along the southwest coast of Newfoundland, is the preferred candidate for the Laurentian Channel marine region. It is situated to the immediate southeast of the SEA Update Area. No establishment studies are currently being undertaken for this area. • A potential candidate NMCA site has been identified for the North Gulf Shelf region, in the Jacques Cartier Passage between the Mingan Islands and Anticosti Island. No establishment studies are currently being undertaken for this area." • Add another subsection titled "National Parks (NP) / National Historic Sites (NHS)" with the following text: <p>"Parks Canada establishes National Parks and National Historic Sites with a landbase under the <i>Canada National Parks Act</i>. National parks are created to protect representative examples of Canada's 39 terrestrial natural regions, while national historic sites commemorate significant historical locations or themes. Oil and gas exploration and development are prohibited within national parks and National Historic Sites administered by Parks Canada, which encompass both surface and subsurface resources. Most of Parks Canada's sites in Eastern Canada are located along the coast, including all of those within the Gulf of St. Lawrence (Gros Morne NP, Port au Choix NHS, Cape Breton Highlands NP, Prince Edward Island NP, Kouchibouguac NP, Forillon NP and Mingan Archipelago National Park Reserve; see figure xx). The intertidal zones along the coasts of Gros Morne NP and Port au Choix NHS, as well as the inner portion of St. Paul's inlet in Gros Morne NP are all marine habitats protected under the <i>Canada National Parks Act</i> and fall within the SEA Update Area (figure xx)."</p> <p><i>Note: Parks Canada can provide the shapefiles for the national parks, national historic sites and national marine conservation areas/marine protected area proposals/candidate NMCA's to either add to figure 4.50, which covers DFO sites (and which would presumably be moved to the new section) or to create a complimentary figure to 4.50 with Parks Canada sites.</i></p>	



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	<i>Should also maybe put CWS refugees in map?</i>	
S201	\$4.3.1 Regions and Communities, 2nd last bullet, pg 236 - It would be applicable to note that the Regional Economic Development Boards will soon be no more. Within the next few months many of them will already have ceased to exist. This will negatively affect the level of information available when it comes to rural economic information and development.	<ul style="list-style-type: none"> Text has been added to this section to reflect this
S202	<p>\$4.3.4 Economy, Employment and Business, pg 244 – Information on the economic importance of the tourism sector is missing from this section and cannot be found anywhere else in the document, including \$4.3.6.7 Marine-Based Tourism).</p> <p>Gros Morne National Park and Port au Choix NHS are both found in Economic Zone 7. More than 170,000 people visit GMNP annually, and tourism in / around Gros Morne brings in >\$37 million in spending and accounts for 28% of employment in the region. Detailed information is provided in Parks Canada's submission to AMEC and should be added here.</p> <ul style="list-style-type: none"> Note: There is an odd breakdown within this section, as marine fisheries and tourism are considered separate from economy, employment and business. 	<ul style="list-style-type: none"> The general "Economy, Employment and Business" section appears early and is intended to provide an initial and high-level / overall overview of the regional economy as a whole. Specific relevant sectors of the economy, such as fisheries and tourism, and then expanded on in subsequent and individual sections. "Tourism" has now been broken out a separate subsection (4.3.6.5) which further described tourism activity in Western Newfoundland and its importance. Additional information on GMNP has also been added, here and esp in the new Protected Areas section (4.2.4)



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S203	<p>\$4.3.6.1 Marine Shipping and Transportation, pg 249 – “Harbours are regulated under federal jurisdiction of Canada’s <i>Navigable Waters Protection Act</i> and <i>Fishing and Recreational Harbours Act</i>.</p> <p>Fisheries and Oceans Canada (DFO), through Canadian Coast Guard (CCG) Marine Communications and Traffic Services (MCTS) provides communications and traffic management services in <u>Canadian ports</u>. A number of Western Newfoundland ports and harbours locations are shown in Figure 4.62.”</p> <p>The underlined portion of the statement above can be misleading. If we look at it in general, MCTS does provide marine communications and traffic regulation and services, however we only have traffic schemes into specific ports including Port aux Basques and the Strait of Belle Isle. Given the statement is followed by a diagram with all of the ports highlighted, one could be led to think that CCG provide traffic management into all these ports.</p> <p>Figures 4.62 and 4.63 could be combined to show all activity.</p>	<ul style="list-style-type: none"> • Wording revised slightly to address this issue. • The Figures have been kept separate maps to avoid clutter on a single map, and it is felt that this information is best presented in this manner.
S204	<p>\$4.3.6.2 Protected Areas (On-land and Coastal), pg 255 - This section should be updated to include National Wildlife Areas. Information on Migratory Bird Sanctuaries and National Wildlife Areas and their locations in the Gulf of St. Lawrence can be found at http://www.ec.gc.ca/ap-pa/default.asp?lang=En&n=989C474A-1.</p> <p>An additional section discussing designated areas should be added, and should include Important Bird Areas, Ramsar sites, and WSHRN sites. The following website should be consulted: http://www.ec.gc.ca/habitat/default.asp?lang=En&n=7127734D-1.</p> <p>A complete list of the protected and designated areas that occur in other jurisdictions along the Gulf of St. Lawrence would be useful to include, especially if these may be directly or indirectly affected by accidental events in the SEA area.</p>	<ul style="list-style-type: none"> • New Protected Areas section (4.2.4) has been added and includes information on these areas • Figures showing the general types and overall distribution of protected areas (all types / jurisdictions) have been added, with associated summary text and tables where possible and relevant. • Given the sheer number and distribution of these sites throughout the Gulf, the multiple jurisdictions involved, and the widespread (and not always consistent or compatible) information that is available on these (which resides in many sources), it has not been possible (nor is it considered necessary) to identify each and every such site by name and describe it in detail in the report. • The SEA Update does, however, now provide Figures showing these protected areas by type,



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		text describing these in general, and additional information on key locations and protected areas and types – At a type and level of information that is appropriate for an SEA
S205	<p>§4.3.6.2 Protected Areas (On-land and Coastal), pg 255 - Include as part of the new Protected Areas section. See wording suggested above and adjust that text and the following comments to include all the appropriate information.</p> <ul style="list-style-type: none"> Discuss the status of GMNP as a UNESCO World Heritage site, which makes it an internationally significant site for both its geology and scenic value. Details are in section 5.1 of Parks Canada's submission to AMEC. 	<ul style="list-style-type: none"> Reference to GMNP's UNESCO status is included
S206	<p>§4.3.6.2 Protected Areas (On-land and Coastal), Table 4.85, pg 255 - Include as part of the new Protected areas section</p> <ul style="list-style-type: none"> For Gros Morne NP -- replace "day use" and "camping" bullets under Purpose with: Protect an outstanding example of the Western Newfoundland Highlands natural region. Provide opportunities for visitor appreciation and learning. 	<ul style="list-style-type: none"> Text updated to reflect this
S207	<p>§4.3.6.3 Marine Protected Areas, pg 256 - Include as part of the new Protected Areas section. See wording suggested above and adjust that text and the following comments to include all the appropriate information.</p> <ul style="list-style-type: none"> Add second sentence to 1st paragraph: "However, Gros Morne National Park and Port au Choix National Historic Site extend to the normal low water mark and Gros Morne includes the inner portion of St. Paul's Inlet. Both sites are protected under the <i>Canada National Parks Act</i> and are within the SEA Update Area. 2nd paragraph – not sure why The Gully is mentioned here, as it is not within the Gulf of St. Lawrence 	<ul style="list-style-type: none"> Reference to the fact that these sites are protected and that this protection extends into the marine env is included in Section 4.2.4. Gully and St Anns Bank have been retained on Figure given base map area coverage, but text and table have been clarified to specify that these are not located within the Gulf itself.



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S208	<p>§4.3.6.3 Marine Protected Areas, Table 4.86, pg 258 - Include as part of the new Protected Areas section plus:</p> <ul style="list-style-type: none"> • The Gully and St. Anns Bank MPAs does not fall within the Gulf of St. Lawrence. • Add another row to include the île de la Madeleine study: <ul style="list-style-type: none"> ○ Name/location: île de la Madeleine study area surrounds the Magdalen Islands in the southern Gulf of St. Lawrence ○ Description/Special features: <ul style="list-style-type: none"> ▪ 17,000 km² study area encompasses a variety of shallow marine habitats ▪ Diversity of fish, invertebrate, marine plant, seabird, shorebird and seal species ▪ Important spawning and nursery habitats for numerous commercial fish and invertebrate species ▪ Breeding habitat for 20% of the national population of northern gannets ▪ One of the main whelping grounds for harp and hooded seals ▪ Significant maritime culture and history, including numerous shipwrecks ○ Conservation purpose/status: <ul style="list-style-type: none"> ▪ To represent the Magdalen Shallows marine region and protect littoral, estuarine and marine biodiversity. ▪ Presently the subject of a joint Canada/ Quebec feasibility study for the establishment of a marine protected area announced in 2011. Study to be completed in 2014, to be followed by a decision on the type of marine protected area which should be pursued. 	<ul style="list-style-type: none"> • Please see above comment re inclusion of Gully and St Anns Bank • Added text about the Magdalen Islands MPA study in the report. (not included on map to avoid confusion - As the Figure shows existing and formally designated MPAs etc)
209	§4.3.6.3 Marine Protected Areas, Table 4.86, pg 259 - Blue Whales are another Species at Risk that are found in the Laurentian Channel Area of Interest and should be included in the table.	<ul style="list-style-type: none"> • Added to relevant Table
S210	§4.3.6.4 Marine Cables, 1st para., pg 259 – The level of detail is not consistent in this section. Can any more information be provided on the existing submarine cable in the SEA Update Area? There is a lot of detail, maybe more than is necessary, on the proposed Emera project.	<ul style="list-style-type: none"> • Limited information on this marine cable is available, but some additional information has been sourced and included. • Some of the detail on the Emera Maritime Link TL project has been removed as requested.
S211	§4.3.6.8 Other Current or Traditional Uses of the Marine and Coastal Environments, pg 266 – With regard to the statement “Data are not available on the number of hunters, success rates of hunts or total number of birds taken.”, some data of this nature may exist within Environment	<ul style="list-style-type: none"> • Data inquiry made to CWS and information provided regarding Western NL licence sales has been inserted into this section.



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Canada. Please contact EC-CWS if interested in obtaining this data.		
<p>S212 Section 5 Environmental Interactions, Mitigation and Key Planning Considerations, pg 269 – General – THE EFFECTS ASSESSMENT WILL NOT DETERMINE LIKELIHOOD OF SIGNIFICANCE. Significance of effects will be determined during the project-specific environmental assessment process.</p>	<ul style="list-style-type: none"> The SEA Report does not predict environmental effects or evaluate their significance Although the “significant” is inevitably used in places, it is not used in the discussion or description of environmental effects. We have completed a search for this word, however, and replaced it with another where possible in specific instances 	
<p>S213 Section 5 Environmental Interactions, Mitigation and Key Planning Considerations, pg 269 – General – As per the Scoping Document, “a description of the interactions of petroleum exploration and production activities with the environment will be presented”. Proposed activities include production activities. This appears to be absent in this section.</p>	<ul style="list-style-type: none"> - Addition reference to possible production activities has been added throughout the SEA Update Report, including Ch 5 (again, to the degree possible and meaningful in an SEA) 	
<p>S214 Section 5 Environmental Interactions, Mitigation and Key Planning Considerations, pg 269 – General – Tables 5.1, 5.2, and 5.3 should be consistent (e.g. subheadings Seismic Surveys, Drilling, Production). Titles should include (including Species at Risk).</p>	<ul style="list-style-type: none"> Tables and titles revised as requested for consistency 	
<p>S215 Section 5 Environmental Interactions, Mitigation and Key Planning Considerations, pg 269 – General – The title of subsections should be consistent (e.g. Section 5.2.3.2 and 5.3.3.2) throughout all of Section 5 and inclusive in each VEC (e.g. Section 5.2.3.3 – Seasonal Considerations is not included in Fish & Fish Habitat or Marine Mammals & Sea Turtles).</p>	<ul style="list-style-type: none"> The section titles have been revised to make them consistent 	
<p>S216 \$5.1 Fish and Fish Habitat (Including Species at Risk), pg 269 - This section largely disregards potential inshore effects. As briefly discussed in Section 2.2.2.3, future development may incur onshore effects through horizontal drilling, increased traffic, mooring etc... Potential effects and mitigation and planning considerations for the inshore should be developed. As one example, in Table 5.1 under the ‘Vessel Traffic’ component, introduction and spread of aquatic invasive species and resulting habitat degradation should be included. See:</p> <p><i>Morris, C.J., Gregory, R. S., Laurel, B.J., Methven, D.A., and Warren, M.A. 2011. Potential effect of eelgrass (Zostera marina) loss on nearshore Newfoundland fish communities, due to invasive green crab (Carcinus maenas). DFO Can. Sci. Advis. Sec. Res. Doc. 2010/140. iv + 17 p.</i></p>	<ul style="list-style-type: none"> Additional reference to onshore and nearshore activities and effects has been worked in throughout these sections, including the issues noted. 	



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<p>http://www.dfo-mpo.gc.ca/CSAS/publications/resdocs-docrech/2010/2010_140_e.pdf</p>	
<p>S217 §5.1.1 Potential Environmental Interactions and Effects, Table 5.1, pg 270 - It would be useful to see a fourth column for mitigations included in Table 5.1. Also applicable to Table 5.3 on Page 291.</p>	<ul style="list-style-type: none"> The Tables have been revised to add an additional column that lists various (standard) mitigation measures that apply to each activity / component
<p>S218 §5.1.1 Potential Environmental Interactions and Effects, pg 270–273 - No information is given on the extent of what can be planned and routine activities (<i>planned and routine petroleum activities</i>) in terms of spills (<i>discharge</i>) on the fish habitat.</p> <p>It is suggested to provide a table detailing each of the usual routine activities, as well as potential (scheduled or routine) and indicate the frequency, extent or the possible range of and confirmed (after the tracks of other projects) or potential impacts.</p> <p>No information is provided on the noise levels associated with the effects in fish and invertebrates, or the distances at which these effects are perceived.</p> <p>In this section effects on marine invertebrates (not very mobile organisms) should be separate from the effects on fish. Mitigation measures associated with effects on marine invertebrates or fish will be possibly different (e.g. the <i>soft-start</i> or procedure of gradual increase in intensity of seismic surveys to allow marine organisms to flee does not apply to the immobile organisms).</p> <p>Table 5.1 - Complete and specify the description of effects with other examples of more up-to-date and relevant studies:</p> <ul style="list-style-type: none"> Airgun operations : mention the potential effects of seismic surveys on the phytoplankton and zooplankton. The scientific advice to fisheries and Oceans Canada (DFO 2003) on the environmental assessment report completed the projects of seismic surveys in the Gulf of St. Lawrence to the West and South of Anticosti Island, mentions a study (Gausland 1993) which considers the effect guns would cause significant mortality of plankton to affect power equivalent to 30 whales. 	<ul style="list-style-type: none"> Wording of the first part of this comment is not clear. The SEA Update is intended to provide a general analysis of environmental issues and mitigation at a level of detail and specificity that is possible and appropriate for an SEA and relevant to a strategic level of planning. This request for information on effects and their frequency, extent etc are more relevant to the actual prediction and evaluation of environmental effects. The SEA Update scoping document and subsequent direction to the study team has stated specifically that the SEA Update should NOT predict effects or evaluate their significance. Fish and benthos are considered and addressed within a single VEC for the reasons outlined earlier in the scope chapter (identification of VECs), and this is common and accepted practice in EAs in NL and elsewhere. Where relevant, however, differences in env issues and mitigation between fish and benthos have been highlighted throughout the SEA Update (e., ramp up for seismic most relevant to finfish). Again, and as stated in the SEA Update Report in



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	<ul style="list-style-type: none"> Airgun operations: Refer to the study by Payne et al. (2008) about the chronic effects and effects on populations. Airgun operations: Refer to the study of Hastings and Popper (2005). Although it focuses on the effects of noise associated with the pile-driving, it provides a summary of the effects of underwater noise on fish, as well as the sound exposure levels associated. Airgun operations: for example, refer to the study of Lokkeborg (1991), which showed a decrease in the rate of cod catches during seismic surveys. This effect would have been felt within a radius of 10 km and lasted 24 hours after the cessation of activities. Lokkeborg (2012) shows that seismic surveys can in contrast to increase catches to gillnets in some species (orange rockfish, halibut), but decreased catches longline for other species (Greenland halibut, haddock). These results are explained by increased swimming activity and a decrease in the behavior of exposed fish foraging. Seismic changed the catch of all species studied at rates indicating that they react to seismic sound. Accidental spill of oil: could incorporate the results which are starting to emerge on the Deep Water Horizon incident studies in the Gulf of the Mexico. Well abandonment: Add studies on the effects of blasting on fish and fish habitat, as well as on exposure levels (e.g. Wright & Hopky 1998). <p>Table 5.1, 2nd column - Habitat alteration: examples to demonstrate that habitat can recover quickly focused on the meiobenthos. These species have a very short life cycle and do not represent the resilience of fished species. Additional examples to estimate the recovery time for the productivity of fished species should be provided.</p>	<p>various places "This analysis has been generally informed by the available literature and other existing information on the effects of offshore oil and gas activities and their associated environmental interactions on each of the VECs, a detailed review and discussion of which was provided in the 2005 SEA Report (LGL Limited 2005), and which has been reported extensively in other sources. Indeed, a discussion of such "existing knowledge" has formed a significant proportion of the total report content in previous SEAs completed in the NL Offshore Area, and the intent is not to repeat that information here. Instead, these sections of the SEA Update provide a general identification and overview of the known and likely environmental issues and interactions associated with offshore exploration (and to a lesser degree, development) activities, only as background and context for identifying key issues and associated environmental planning considerations."</p> <ul style="list-style-type: none"> The various issues and references cited in the review comment have been incorporated throughout this section as applicable (particularly, in the Table).
S219	<p>§5.1.1 Potential Environmental Interactions and Effects, Table 5.1, 3rd column, 3rd bullet, pg 272</p> <p>–Reference is made to Santosa et al 2009; Jorissena et al 2009, which is cited in support of effects are limited to 500 m. This study was conducted on deep-sea macrobenthic communities in the Campos Basin, off the southeastern Brazilian coast in 902 m water depth. The oceanographic, environmental and ecology setting of offshore Brazil would seem to be distinctly different than that of western Newfoundland. How the specific conditions of the report's study area are similar to and relate to Western Newfoundland need to be shown. Otherwise, the inference that the</p>	<ul style="list-style-type: none"> Text and references have been revised to address the various comments and suggestions provided here (particularly, in the Table).



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	<p>study's conclusion is valid for western Newfoundland is not valid.</p> <p>The third bullet also states "studies show", however only one area specific study was referenced. Studies implies more than one so there should be more than one study referenced or a generic reference that is a summary of a number of studies.</p> <p>Fifth bullet there is a reference to Netto et al 2010; Manoukian et al 2010, as with the second comment above, the study was conducted off Brazil. Again a relation to the condition of the report's study area needs to be related to SEA Update Area.</p>	
S220	<p>§5.1.2 Environmental Mitigation Measures, pg 273-274 - Although a list of mitigation measures is given, no indication of the actual effectiveness or demonstrated by these measures, or if they have been implemented at other drilling and exploration carried out in Newfoundland is provided. These measures seem more theoretical practice. It is impossible for the reader to determine how these measures will help to mitigate the effects on fish habitat.</p> <p>This section lists 16 too general and sometimes incomplete typical mitigation measures to anticipate the lack of significant residual effects after implementation. The effectiveness of the measures presented is not discussed, but should be. The effectiveness of certain measures (e.g. <i>"use of soft-start procedures" or "effective spill preparedness and response plans in place"</i>) is not always demonstrated. For other measures (e.g. <i>avoidance of known sensitive areas / times or in the planning and conduct of offshore or nearshore exploration activities</i>), their effectiveness depends on biological knowledge and the gaps. For example, Section 5.1.5. focuses on information availability and knowledge (p. 280) and indicates that <i>"the life history and times of the three wolfish species spawning in the Gulf remain somewhat unclear, and there is limited information on the distribution of important fish and invertebrates' eggs and larvae"</i>.</p> <p>This section should:</p> <ul style="list-style-type: none"> • Present in the form of a table, measures associated with each type of effect to determine if they are all covered; • Discuss the effectiveness of each measure based on past studies and data available / gaps and indicate if there could be unknown or residual effects in some cases; • Submit appropriate follow-up measures of the effects/absence of effects on fish and fish 	<ul style="list-style-type: none"> • The SEA Update is intended to provide a general analysis of environmental information, issues and mitigation at a level of detail and specificity that is possible and appropriate for an SEA and relevant to a strategic level of planning (in this case, offshore exploration licensing) • This has, as specified in the Scoping Document, included the identification of mitigation measures which are typically implemented / required for such activities, as well as the potential identification of any others that may be required or appropriate (Although again, at this stage we have been instructed to not provide any such recommendations until the SEA process is further advanced). This is also reflected in the C-NLOPB's note in Chapter 6 of the Draft SEA Update • In terms of a discussion / analysis of the effectiveness of such mitigation, a detailed review and analysis of this (from the literature) is not part of the scope of this exercise, was not mentioned in the scoping document or contract, nor (and most importantly) are we aware that it has been completed in any other SEA or Project EA in NL --



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<p>habitat;</p> <ul style="list-style-type: none"> • Incorporate measures to avoid killing or injuring fish by blasting (e.g. DFO Guidelines (Wright & Hopky, 1998)); • Incorporate measures listed in the statement of Canadian practice on the mitigation of seismic sound in the marine environment available at: http://www.dfo-mpo.gc.ca/oceans/management-gestion/integratedmanagement-gestionintegree/seismic-sismique/index-fra.asp; and • Submit appropriate follow-up measures of the effects/absence of effects on fish and fish habitat. <p>This section should provide a table where, for each of the measures, it would be appropriate if it has already been used, in what context, how and what have been the results obtained from its use.</p> <p>Discuss the effectiveness of the measure <i>Oil spill prevention plans and procedures, with associated and preparedness years effective spill response plans in place</i> in the light of the latest report of the Commissioner of the environment and sustainable development, particularly as regards the assurance of an effective spill response. Report available at: http://www.oag-bvg.gc.ca/internet/Francais/parl_cesd_201212_f_37708.html. On the other hand, indicate the measures recommended in the event of a spill in the presence of ice.</p>	<p>and esp, not the 2005 SEA that we are updating.</p> <ul style="list-style-type: none"> • Moreover, many of the mitigations referenced in the SEA Update are standard and are routinely required by regulatory agencies reviewing offshore projects, and even in some cases are formalized and required through “codes of practice” released by government agencies (such as by DFO for seismic). • A “measure by measure” review and analysis of the known effectiveness of each such standard and widely used mitigation is therefore not considered to be part of the scope of this exercise, and while it may be useful, is certainly not specific to the Western NL Offshore Area or this SEA Update. • To attempt to address this review comment (and later, related specific comments on Chapter 5) we have added discussions that recognize on-going questions and uncertainty around the effectiveness of select measures, in order to recognize in the analysis that it is not necessary a given that all such measures will be 100% effective in all circumstances. • We suggest that this “recognition” fits best in the “data gaps” section for each relevant VEC, and have therefore included it there (as agreed with C-NLOPB) • Reference to the Fall 2012 Report of the <i>Commissioner of the Environment and Sustainable Development</i> has been added in Chapter 3 and elsewhere, incl overview of issues raised and C-NLOPB responses.



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<p>S221 \$5.1.2 Environmental Mitigation Measures, pg 273 - Avoidance of sensitive areas or times is proposed in section 5.1.2 as mitigation for potential effects of oil and gas activities in the SEA. This presumes that sensitive areas have been identified before or during planning of operations. The SEA document has not done this at the scale that is relevant to the coastal zone except for referencing Catto's 2011 work. Sensitive areas of the coastal zone should be identified and any lacking information should be indicated in section 5.1.5 Information availability and requirements.</p> <p><i>Catto, N.R. 2011. Coastal Erosion in Newfoundland. Newfoundland & Labrador Ministry of Environment and Conservation.</i></p> <p>This section should also refer to the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment.</p>	<ul style="list-style-type: none"> • Additional information / emphasis on coastal areas has been added to Chapter 4 (where possible, based on availability, nature and scale of existing information). • The importance and sensitivity of these areas has been further reinforced in Chapter 5. • The "Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment" is now described in detail (and included) in Ch 5.
<p>S222 \$5.1.2 Environmental Mitigation Measures, 7th bullet, pg 273 – Does "contaminated" deck drainage mean "contaminated"?</p>	<ul style="list-style-type: none"> • Comment unclear (same word used)? • It means contaminated, but also that which is 'contained' within the system. • Word revised to address, here and throughout.
<p>S223 \$5.1.2 Environmental Mitigation Measures, last bullet, pg 273 – Replace text with "<i>Water contaminated with hydrocarbons generated during flow testing, within certain tolerances, can be atomization in the flare (using high efficiency burners) of the flow or shipped on-shore for disposal</i>".</p>	<ul style="list-style-type: none"> • Text replaced as requested
<p>S224 \$5.1.2 Environmental Mitigation Measures, 2nd bullet, pg 274 – A berm is typically established around storage units.</p>	<ul style="list-style-type: none"> • Reference to such berms also encompassing storage units has been added
<p>S225 \$5.1.2 Environmental Mitigation Measures, 3rd bullet, pg 274 – What is being "mechanically cut and recovered"?</p>	<ul style="list-style-type: none"> • Text has been revised slightly to clarify what this is referring to (generally, to well abandonment)
<p>S226 \$5.1.2 Environmental Mitigation Measures, 4th bullet, pg 274 – For what purpose would blasting be required?</p>	<ul style="list-style-type: none"> • Text has been revised slightly to clarify what this is referring to (generally, to well abandonment)
<p>S227 \$5.1.2 Environmental Mitigation Measures, 1st para., last line, pg 274 – Reference should be made to "production" as well.</p>	<ul style="list-style-type: none"> • Text revised (here and throughout) to better reflect focus on production as well
<p>S228 \$5.1.2 Environmental Mitigation Measures, 2nd para., line 3, pg 274 – Delete "the regulatory reviews for such projects often include a requirement for project-specific acoustical modeling".</p>	<ul style="list-style-type: none"> • Text delete (here and throughout)
<p>S229 \$5.1.2 Environmental Mitigation Measures, 3rd para., line 2, pg 274 – Delete "often".</p>	<ul style="list-style-type: none"> • Text deleted as requested



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S230	§5.1.3 Environmental Planning Considerations, pg 274 – The content you have provided does not provide any guidance for planning considerations.	<ul style="list-style-type: none"> This is a statement, not a correction or request for information. We disagree. The SEA provides information of, for eg, a number of important species, areas, times etc which can and should be considered in related planning. This has been completed to the type and level that is possible and appropriate given the existing and available information. This is also comparable to the information and outcomes provided in other SEAs, including the 2005 Western NL SEA which we are updating here (although the SEA Update presents considerably more information and identifies a greater number of sensitive areas etc).
S231	§5.1.3.1 Marine Fish Species at Risk, pg 275 - There is a lot of duplication with Page 181, 4.2.1.6 . Again it does not state the fact that most catches for the three wolffish species have taken place within the SEA Update Area, understating the importance of this area for wolffish. As such, Figure 5.1 does not do justice to wolffish. Mitigation measures are lacking that address the importance of the SEA Update Area for 2 threatened fish species and one species of special concern.	<ul style="list-style-type: none"> Revised text as suggested citing new references.
S232	§5.1.3.1 Marine Fish Species at Risk, pg 275 - This section does not mention that American Eel, which are designated as threatened, will migrate through the Gulf as larval Eels (<i>leptocephali</i>) or Glass Eels (quite likely by the millions) in the spring and adults will migrate through the area in the fall.	<ul style="list-style-type: none"> Revised text adding text on eels
	Page 275 states <i>"There is, however, a recovery strategy outlined in Kulka et al (2007) to help increase the population levels and distributions of these wolffish species."</i> This section should note the identification and protection of critical habitat under SARA.	<ul style="list-style-type: none"> Revised text and added suggested text
S233	§5.1.3.2 Important Areas and times for Fish and Fish Habitat, pg 276 – It is stated that <i>"Areas with high meroplankton that are critical to recruitment of key species along the west coast of Newfoundland..."</i> In addition to cod, herring and capelin areas, there is also the main redfish larval zone in the area	<ul style="list-style-type: none"> Revised text adding suggested text



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of interest (see Table 6, IA#4 in Savenkoff et al., 2007).	
<p>S234 §5.1.3.2 Important Areas and times for Fish and Fish Habitat, Figure 5.1, pg 276 - Figure 5.1 would be augmented with the inclusion of information about Eelgrass (ecologically significant species) distributions. See page 17 in:</p> <p><i>Templeman, N.D. 2010. Ecosystem status and trends report for the Newfoundland and Labrador Shelf. DFO Can. Sci. Advis. Sec. Res. Doc. 2010/026. vi + 72 p.</i></p>	<ul style="list-style-type: none"> • Added new Figure in Chapter 4 with eelgrass distributions and additional description. • Importance of eelgrass also now reinforced / referenced in Chapter 5.
<p>S235 §5.1.3.2 Important Areas and Times for Fish and Fish Habitat, 1st para., line 3, pg 277 – Figure 5.1 does not include all the areas previously discussed in the report.</p>	<ul style="list-style-type: none"> • This map was not meant to identify every area previously identified before as important but rather serve as a concise focused identification of major areas of concern. • Figure has been expanded to include additional items. With that, the map was becoming increasingly cluttered, and it was difficult to be both clear yet comprehensive. • It was also noted that this Figure (which initially was in Ch 5) contained info on certain imp areas that was not presented earlier in the current structure. • For that reason, it was decided to move this Figure back to Ch 4, and to have it include only the info that is not included on other maps (esp, the imp sites identified through consultation etc) • Each of the sections of Ch 5 now refer back to the text and Figures in Ch 4 when summarizing specific sensitive and imp areas and times.
<p>S236 §5.1.3.2 Important Areas and Times for Fish and Fish Habitat, 8th bullet, pg 277 - Sally's Cove should be added to the list of spring spawning sites for herring.</p>	<ul style="list-style-type: none"> • Added Sally's Cove
<p>S237 §5.1.3.2 Important Areas and times for Fish and Fish Habitat, pg 279 – “...The ecosystem in the Gulf of St. Lawrence has been and is changing...”</p>	<ul style="list-style-type: none"> • Added paragraphs in 4.2.1 that discusses references that provide evidence that dispute some of the top-down arguments and provide



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<p><i>Note that, since the mid-1990s, there has been little or no fishing on the large groundfish populations with the exception of northern Gulf cod, where there has been a moderate fishery during most of the past decade);</i></p> <p>hence, factors other than the direct impacts of fishing must be responsible for the lack of recovery or ongoing declines in many groundfish populations. However, following the collapse of larger groundfish and the ensuing predation release, several small-bodied forage species increased considerably in abundance (e.g., daubed shanny <i>Leptoclinus maculatus</i>, hooknose sculpins <i>Artedius</i> spp., northern shrimp in the northern Gulf) (Benoît et al., 2012) while others clearly showed a significant expansion in their geographical distribution (horizontal) in the entire Gulf of St. Lawrence (capelin: Gregoire et al., 2005; herring: DFO 2006a, b) or a deepening of their vertical distribution (capelin: Mowbray, 2002; herring: McQuinn, 2009).</p> <p><i>Benoît, H. P., C. Savenkoff, P. Ouellet, P. S. Galbraith, J. Chassé, and A. Fréchet. 2012. Impacts of fishing and climate-driven changes in exploited marine populations and communities, with implications for management. In: State-of-the-Ocean Report for the Gulf of St. Lawrence Integrated Management (GOSLIM) Area. Edited by Benoît, H. P., J. A. Gagné, C. Savenkoff, P. Ouellet, and M.-N. Bourassa. Canadian Manuscript Report of Fisheries and Aquatic Sciences, 2986, pp. 36-50.</i></p> <p><i>DFO, Department of Fisheries and Oceans. 2006a. Assessment of the Quebec North Shore (Division 4S) herring stocks in 2005. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/020: 14 pp.</i></p> <p><i>DFO, Department of Fisheries and Oceans. 2006b. Assessment of the west coast of Newfoundland (Division 4R) herring stocks in 2005. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2006/021: 12 pp.</i></p> <p><i>Grégoire, F., Savenkoff, C. and Chabot, D. 2005. Capelin (<i>Mallotus villosus</i>) of the Estuary and Gulf of St. Lawrence (NAFO Divisions 4RST) in 2004. DFO Can. Sci. Advis. Sec. Res. Doc. 2005/058: iv + 55 pp.</i></p> <p><i>McQuinn, I. H. 2009. Pelagic fish outbreak or suprabenthic habitat occupation: legacy of the Atlantic cod (<i>Gadus morhua</i>) collapse in eastern Canada. Can. J. Fish. Aquat. Sci., 66: 2256–2262.</i></p>	<p>evidence or more bottom-up controlling mechanisms</p> <ul style="list-style-type: none"> Changed the wording in the last paragraph in Section 5.1.3.2 to state that although there is disagreement on what caused this tropic shift, it is generally agreed that changes have occurred.



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	Mowbray, F.K. 2002. <i>Changes in the vertical distribution of capelin (Mallotus villosus) off Newfoundland</i> . ICES J. Mar. Sci. 59: 942–949.	
S238	<p>§5.1.4 Cumulative Environmental Effects, 1st para, pg 280 - “cumulative effects are unlikely to occur.” It seems unreasonable to state that cumulative effects are unlikely, since the methodology is not allowing an overall assessment of cumulative effects, as most of the future activities aren’t being examined.</p> <p>The following statement is made in each of these sections (pages 279-280) for fish, birds and marine mammals (Note that in the quotation the text is bolded by the Science reviewer, not the SEA author, to emphasize the problematic statement): “...This anticipated level of exploration in the Western NL Offshore Area and the relatively short-term nature of these individual actions will likely mean that seismic surveys and drilling programs (and possibly, any development projects) will likely be separated enough in space and time that cumulative effects are unlikely to occur.” A similar statement is made on page 288, Section 5.2.4 for marine birds.</p> <p>The SEA is generally comprehensive and up to date in the presentation of information about Valued Environmental Components (VECs) within the area, their distribution and relative abundance (based on RV surveys). However, it is unclear how this statement can be made in the SEA without identifying the assessment methodology used to arrive at this conclusion. It is assumed that this (“...cumulative effects are unlikely to occur.”) is a speculative statement and should be identified as such by the consultant.</p> <p>As currently presented on page 280, statements including “...will likely be separated enough in space and time that cumulative effects are unlikely to occur” and “...these are therefore unlikely to overlap in space or time”, are weak and unsubstantiated. These should be supported by specific mitigation options for EAs of any future developments.</p>	<ul style="list-style-type: none"> • These and other sections on cumulative effects have been revised (wording) to make it clearer what is being referred to • In general, and as per the SEA as a whole, the intent is not to assess (predict) effects, but rather, identify planning issues etc. • The point is that, in the case of future oil and gas activities themselves, these projects and their effects will not likely overlap to results in cumulative effects. • The cumulative effects sections also clearly and integrally consider the effects of other past and on-going and future projects and activities in the region – such as fishing, vessel traffic etc. • Mitigation measures are described at a general level, as per SEA Update scope. • In terms of mitigating CEs, this includes noting that separation of future projects in time and space would and should be considered in project EA reviews.
S239§5.2 Marine Birds (Including Species at Risk), pg 281 - General comments concerning lighting:	<p>Bright exterior lights and/or substation lights can attract night-migrating birds and night-flying seabirds (e.g. storm-petrels), and result in injuries or death to migratory birds. Particularly sensitive times for impacts on migratory birds include (1) spring (April 1st to June 1st) and fall migration (July 15th to October 30th) periods, and (2) under specific meteorological conditions such</p>	<ul style="list-style-type: none"> • General reference to these sorts of lighting related mitigations and bird related protocols have been added to and referenced in this section • This information has been added in a relatively general and generic way, appropriate to an SEA. .



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<p>as fog or inclement weather.</p> <p>In order to minimize the risk to migratory birds, EC-CWS recommends that the minimum amount of pilot warning and obstruction avoidance lighting should be used on tall structures. The use of only strobe lights at night, at the minimum intensity and minimum number of flashes per minute (longest duration between flashes) allowable by Transport Canada, is recommended. Also, using the minimum number of lights possible is recommended. The use of solid-burning or slow pulsing warning lights at night should be avoided.</p> <p>Additional mitigation measures could include extinguishing non-essential lights (not including obstruction marking and lighting required by Transport Canada for aeronautical and navigational safety) when migratory birds are particularly vulnerable to impacts (e.g., during spring and fall migration, during inclement weather), installation of motion detector lighting systems, and using the minimal allowable flashing frequency for night lighting of the oil platform and transport ships.</p> <p>Several additional protocols concerning marine birds and mitigations used in offshore operations are attached.</p>	
<p>S240 \$5.2.1 Potential Environmental Interactions and Effects, 1st bullet, pg 281 - Terrestrial and marine birds may also be attracted to onshore drilling installations along the coast and subject to the same risks.</p>	<ul style="list-style-type: none"> Reference to this issue has been added to this section
<p>S241 \$5.2.1 Potential Environmental Interactions and Effects, Table 5.2, pg 282 - There should also be some mention of potential effects of onshore coastal drilling facilities. Specifically this would include (1) attraction of coastal and terrestrial birds to lights / flares, and (2) attraction / mortality of birds (especially waterfowl) in containment ponds.</p>	<ul style="list-style-type: none"> Reference to these issues has been added here
<p>S242 \$5.2.1 Potential Environmental Interactions and Effects, Table 5.2 (second bullet in 3rd column), pg 283 - In the event of a spill coastal birds are also at great risk on beaches and in intertidal zones...</p>	<ul style="list-style-type: none"> Reference to these issues has been added here
<p>S243 \$5.2.1 Potential Environmental Interactions and Effects, Table 5.2 (ninth bullet in 3rd column), pg 283 - It should be clear that cleaning oiled birds is a weak form of mitigation because the vast majority of oiled birds are never captured / cleaned, even in a focused spill response scenario.</p>	<ul style="list-style-type: none"> Reference to these issues has been added here
<p>S244 \$5.2.2 Environmental Mitigation Measures, pg 284 - This should include mitigation measures for onshore drill sites (e.g. the relatively effective techniques that have been developed to reduce bird</p>	<ul style="list-style-type: none"> General / potential mitigation measures are described here as per SEA Update scope



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mortality in containment ponds).		
S245	<p>§5.2.2 Environmental Mitigation Measures, pg 284 – “The avoidance of known and observed bird colonies and large aggregations of avifauna in the planning and conduct of offshore and near-shore activities.” A similar commitment should be made to avoid listed and/or proposed critical habitat of migratory bird species at risk, as well as protected areas and designated areas.</p> <p>“The avoidance of known and observed bird colonies and large aggregations of avifauna in the planning and conduct of offshore or near-shore activities;”. Change the word “large” to “significant”, as some populations are too small to have “large” aggregations. Significant could be defined at more than 10% of the area (NL SEA) population, or could be obtained from literature.</p> <p>“Programs for the collection and release of marine birds that become stranded on offshore installations”. Protocols should be used for offshore supply and support vessels as well. Should storm-petrels or other species become stranded on vessels, the proponent is expected to adhere to the protocol <i>The Leach’s Storm-Petrel: General Information and Handling Instructions</i> (attached). A permit will be required to implement this protocol and the proponent should be advised that a permit must be in place prior to the initiation of the proposed activities. Please note that the MBCA permit application can be obtained via email at Permi.atl@ec.gc.ca. A copy of the attached protocols should be included as an appendix of this SEA.</p>	<ul style="list-style-type: none"> • Text has been revised as noted. • General reference has also been made to the various protocols and permit requirements noted (again, in a general manner, appropriate to an SEA • We have not attached the protocols to the SEA Report, but rather referenced these and their locations
S246	<p>§5.2.3.1 Marine Bird Species, 1st bullet, pg 285 - Again a list or map of gazetted piping plover critical habitat beaches should be added (see recovery plan on the SARA registry, which includes a list of gazetted critical habitat beaches: http://www.sararegistry.gc.ca/virtual_sara/files/plans/rs_piping_plover_melodus_e1.pdf).</p>	<ul style="list-style-type: none"> • Map added in Chapter 4 and referenced here
S247	§5.2.3.1 Marine Bird Species, 3rd bullet, pg 285 - See earlier comments for other known locations for Barrow’s Goldeneye.	<ul style="list-style-type: none"> • Information added in Chapter 4 and referenced here
S248	§5.2.3.1 Marine Bird Species, 1st bullet, pg 286 - Again, Shallow Bay in GMPN has recently been identified as one of the most important Red Knot stopover sites in Newfoundland with up to 60 individuals present during August and September (See Parks Canada submission).	<ul style="list-style-type: none"> • Information added in Chapter 4 and referenced here
S249	§5.2.3.2 Significant Areas and Habitats for Marine Birds, pg 286 - This section should also include a paragraph about Gros Morne highlighting the fact that Shallow Bay and St. Paul’s inlet are two of the most important coastal bird sites in western Newfoundland (certainly comparable to those described in detail in this section). Relevant justification / data is provided in Parks Canada’s	<ul style="list-style-type: none"> • Paragraph highlighting the importance of Gros Morne to coastal birds has been added. • We have included a figure in Section 4 showing the Piping Plover critical habitat beaches in the Gulf.



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	submission. Also see the piping plover recovery strategy on the SARA registry for a full list of piping plover critical habitat beaches.	
S250	\$5.2.3.2 Significant Areas and Habitats for Marine Birds, pg 286 – The Fish and Fish Habitat section included a Figure of identified important and sensitive areas (Figure 5.1).	<ul style="list-style-type: none"> It did, because this information / specific locations for fish and fish habitat could be identified and mapped based on the information available. That is not the case for marine birds See earlier response re moving this Figure
S251	\$5.2.3.3 Seasonal Considerations for Marine Birds, last line, pg 287 - Upwards of 500 Canada Geese are also present in St. Paul's Bay during staging each fall. Although not nationally significant by CWS standards (i.e. > 1% of the population) this is nevertheless one of the most important staging sites in Newfoundland (see Parks Canada submission).	<ul style="list-style-type: none"> Noted. This sentence has been added.
S252	\$5.2.3.4 Summary of Environmental Planning Considerations for Marine Birds, 1st para., pg 288 - <i>"The overall presence and abundance of marine birds is relatively low in the SEA Update Area as compared to other marine areas off Newfoundland and Labrador and elsewhere. As indicated, there are, however, a number of species at risk that are known to occur in the region, as well as various key areas and times for marine avifauna."</i> This statement is not accurate for migratory shorebirds, which are generally more abundant on the west coast of Newfoundland than elsewhere in the province.	<ul style="list-style-type: none"> Noted. Paragraph has been re-worded to reflect this.
S253	\$5.2.3.4 Summary of Environmental Planning Considerations for Marine Birds, 2nd para., line 2, pg 288 – The statement <i>"The probability of such an event occurring is very low,"</i> should be deleted.	<ul style="list-style-type: none"> Text deleted as requested
S254	\$5.2.5 Information Availability and Requirements, pg 289 - <i>"Operators may also develop and implement operational monitoring programs during offshore exploration programs, which have included bird monitoring during exploration programs off Newfoundland and Labrador. Any and all information gathered through such observations would, over time, also contribute to an expanded information and knowledge base regarding the presence, abundance and spatial and temporal distribution of marine birds in the Western NL Offshore Area."</i> EC-CWS has developed a pelagic seabird monitoring protocol (attached) that is recommended for use by experienced observers on all offshore projects. A guide for pelagic seabirds of Atlantic Canada has also been attached, for assistance in identifying pelagic seabirds in the area. A report of the seabird monitoring program, together with any recommended changes, is to be submitted to EC-CWS on a yearly basis.	<ul style="list-style-type: none"> General information on this and associated protocols has been added to this section



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<p>S255 55.3.1 Potential Environmental Interactions and Effects, 290-292 - No information is provided on the noise levels associated with the effects presented in marine mammals and turtles, or the distances at which these effects are perceived.</p> <p>This section should present the sound exposure levels of marine mammals to which we associate these different effects. It should present the criteria and thresholds of injury, temporary and permanent ear trauma (TTS, PTS) and behavioral changes to marine mammals (e.g., Southall et al. 2007). The section should also present examples of relevant studies indicating the distance to which these different thresholds are met or remotely what the effects have been recorded. Indeed, seismic surveys can produce low levels of noise at considerable distances from their source of emissions. For example, we know that the threshold of auditory trauma marine mammals by seismic shooting is unclear, as only two empirical studies have measured the TTS cannons air in the Odontocetes. However, a recent study (Gedamke et al. 2011) has suggested that a whale located 1 km or even more from seismic shots could be susceptible to a TTS. Under conditions of low ambient noise and good spread, the sounds produced by the airguns used in seismic surveys can be detected within a radius that can reach many thousands of kilometres, sometimes masking the detection of vocalizations emitted by blue whales in affected areas. Nieu Kirk et al. (2004;) Nieu Kirk et al. (2012), and Risch et al. (2012) showed a significant decrease in the occurrence of the vocalizations of humpback whales in response to an acoustic survey located more than 200 km. Castellote et al. (2012) have shown a vast displacement of whales after seismic surveys, an effect that lasted well beyond the performed survey.</p> <p>This section should incorporate available information (which is changing very quickly) on the field of behavioral effects of noise on marine mammals, particularly on auditory masking (including new variables to evaluate it). For example:</p> <ul style="list-style-type: none">• Clark et al. (2009) quantified acoustic habitat loss due to masking produced by noise on whales; and• Nieu Kirk et al. (2012) analyzed 10 years of recording noise in the Atlantic and shown that seismic shots were heard at distances of 4000 km from seismic vessels and were present 80-95% of each month, for more than 12 consecutive months according to the sites. <p>The emergence of a new concept, that of the degradation of marine acoustic habitat (Clark et al,</p>	<ul style="list-style-type: none">• Text and references have been revised to address the various comments and suggestions provided here (particularly, in the Table) – particularly examples of the distances at which marine mammals have been observed to alter their behaviors during seismic activity. .• Again, and as stated in the SEA Update Report in various places “This analysis has been generally informed by the available literature and other existing information on the effects of offshore oil and gas activities and their associated environmental interactions on each of the VECs, a detailed review and discussion of which was provided in the 2005 SEA Report (LGL Limited 2005), and which has been reported extensively in other sources. Indeed, a discussion of such “existing knowledge” has formed a significant proportion of the total report content in previous SEAs completed in the NL Offshore Area, and the intent is not to repeat that information here. Instead, these sections of the SEA Update provide a general identification and overview of the known and likely environmental issues and interactions associated with offshore exploration (and to a lesser degree, development) activities, only as background and context for identifying key issues and associated environmental planning considerations.”• The various issues raised by the reviewer around, for eg, species at risk, the effects of behavioral changes on use of key habitats and/or during key	



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<p>2009), should be dealt with in the SEA Update.</p> <p>This section passes too quickly on endangered species and should detail the aspects which are specific to them (environmental effects, mitigation measures, knowledge gaps, etc.). For example, in Beauchamp et al. (2009), it was mentioned that: for blue whales, although the function of the emitted sound is not established with certainty, it was suggested that a reduction of the distance of communication (masking) could interfere with reproduction by decreasing the effectiveness of males to communicate with receptive females (Croll et al. 2002). Such impact may be significant for a small population (National Research Council, 2003), as is the case for the blue whale. Assuming that the noise has a significant effect on the ability of blue whales to be located for reproduction or any other crucial activity, anthropogenic noise might be a factor negatively affecting the recruitment and recovery of this population (Croll et al. 2002). Furthermore, it should be noted the lack of knowledge of the specific areas supporting biologically essential behaviors for marine mammals because it is a major challenge, especially for species at risk.</p> <p>1st bullet, pg 290 - Possibly there are consequences for sea turtles and marine mammals (MM) to avoid areas repeatedly subjected to seismic, especially when it comes to rare or irreplaceable areas.</p> <p>4th bullet, pg 290 - Include the potential mortality of MM by blasting.</p> <p>Last bullet, pg 290 –Include the potential mortality of MM during spill.</p> <p>Add another bullet for the potential modification of food availability due to the effects of seismic on fish and invertebrate surveys.</p>	<p>life history stages etc have also been incorporated into the discussion.</p> <ul style="list-style-type: none"> The other issues / interactions noted have been included
<p>S256 §5.3.1 Potential Environmental Interactions and Effects, Table 5.3, pgs 291-292 - Examples of more up-to-date studies should be included, such as:</p> <ul style="list-style-type: none"> Air Gun Operations - Add the potential association between the stranding of whales and seismic surveys (see the studies of Malakoff (2002) and Gentry (2002) for a potential correlation with strandings of whales in the Gulf of California in 2002 and the Galapagos in 2000)). Air Gun Operations - Add examples of recent studies that indicate that noise could cause stress and immune depression in the whale (Romano et al. 2004, Rao et al. 2012). 	<ul style="list-style-type: none"> Text and references have been revised to address the various comments and suggestions provided here (particularly, in the Table).



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<ul style="list-style-type: none"> • Vessel Traffic - Add the mortality/injury of MM from possible collisions. Other studies are referenced on this effect. • Vessel Traffic - Add the proven effects of noise associated with maritime traffic on the recent stress of MM. One study demonstrated a correlation between chronic stress observed in a free population of whales in the Bay of Fundy and the exposure to the noise of traffic (Rao et al. 2012.). • Well Abandonment - See Wright & Hopky (1998) for an example of the thresholds of injury or death associated with blasting. • Accidental Spills of Oil - Add the possible mortality of MM. In the light of studies on the Deep Water Horizon incident, it is suspected that this would not be hundreds of dolphins and whales that have died (the recovered carcasses figure) but more than 5,000 individuals (Gero et al. 2011). The difference is explained by the fact that these mammals die away from the coast. 	
<p>S257 Section 5.3 Marine Mammals and Sea Turtles (including Species at Risk), Section 5.3.2 Environmental Mitigation Measures, Section 5.3.3 Environmental Planning Considerations and Section 5.4 Protected and Sensitive Areas, Section 5.4.2 Environmental Mitigation Measures, 5.4.3 Environmental Planning Considerations, pgs 289-300 - With reference to pages 292-294 and 297-298, the mitigation measures listed in the SEA Update are far too generic and do not have much detail. There have been enough operations and associated recommendations to provide more detailed “minimum” practices, such as those described in the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment. If mitigations are warranted for proposed exploration activities in the SEA Update Area, they should be clearly identified and described in the SEA Update. This proactive approach would provide readers with a level of certainty regarding the nature and potential effects of oil and gas exploration activities in this area.</p>	<ul style="list-style-type: none"> • The SEA Update is intended to generally identify env issues, review the available mitigation, and identify any env planning considerations and possible requirements to guide future licencing. • This has, as specified in the Scoping Document, included the identification of standard mitigation measures which are typically implemented / required for such activities, as well as the potential identification of any others that may be required or appropriate. Standard and “minimum” mitigations are referenced throughout the SEA Update, including the addition of further information on the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment • At this stage we have been instructed to not provide any such recommendations for new or additional mitigation until the SEA process is further advanced



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S258	<p>\$5.3.2 Environmental Mitigation Measures, pg 293 - The development of the best possible monitoring program that will produce and distribute important sighting data for marine mammals, and other marine species seen at or near the surface is encouraged. Such monitoring should be conducted using a set of consensual guidelines with the object of providing the best possible data. Using a dedicated and qualified marine mammal observer will provide both (1) a significant improvement in monitoring, and (2) reliable new information on marine mammals in this area.</p>	<ul style="list-style-type: none"> The text has been revised to reference these concepts and the benefits of same for improving the information base and understanding over time
S259	<p>\$5.3.2 Environmental Mitigation Measures, pg 293 - See comments already issued on the mitigation measures for fish since it seems that it is the same (16) mitigation measures that are proposed for marine mammals.</p> <p>The feasibility and effectiveness of the General measures proposed to avoid residual effects on marine mammals are not discussed and should be. Presented measures are criticised in the literature (e.g. <i>soft-start procedures</i> Compton et al. (2008)). For other measures, e.g. <i>avoidance of known sensitive areas / times or in the planning and conduct of offshore or nearshore exploration activities</i>, their effectiveness depends on the biological knowledge or deficiencies in the material. For example, Section 5.3.3.(p. 295) "<i>Clearly, the region is inhabited by marine mammals and sea turtles at various time of the year, a number of which are considered at risk</i>". In addition, the study area straddles one of the areas of ecological and biological interest (EBSA) for marine species identified by DFO (2007) and one of the areas of interest for marine mammals identified by Lesage et al. (2007)</p> <p>This section should:</p> <ul style="list-style-type: none"> Present in the form of table measures associated with each type of effect to determine if they are all covered; Discuss the effectiveness of each measure based on past studies and data available / gaps and indicate if there could be unknown or residual effects in some cases; Incorporate measures listed in the statement of Canadian practice on the mitigation of seismic sound in the marine environment available at: http://www.dfo-mpo.gc.ca/oceans/management-gestion/integratedmanagement-gestionintegree/seismic-sismique/index-fra.asp; Incorporate the elements contained in notice 2010/043 of DFO (2011), which provides a series of guidelines on the effectiveness of the mitigation of the potential effects of seismic sound on 	<ul style="list-style-type: none"> Please see above responses related to these matters and the scope of the SEA Update



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	<p>marine mammals;</p> <ul style="list-style-type: none"> • Incorporate measures to avoid killing or injuring fish (within the meaning of the Fisheries Act) by blasting (e.g., DFO (Wright & Hopky, 1998) guidelines). • Submit appropriate follow-up measures of the effects/absence of effects on fish and fish habitat; and • Discuss the effectiveness of the measure “Oil spill prevention plans and procedures, with associated and effective spill preparedness response plans in place” in light of the last report of the Commissioner of the environment and sustainable development, in particular concerning the assurance of an effective spill response. Report available at: http://www.oag-bvg.gc.ca/internet/Francais/parl_cesd_201212_f_37708.html. On the other hand, indicate the measures recommended in the presence of ice spill. 	
S260	\$5.3.3.1 Marine Mammal and Sea Turtle Species at Risk and \$5.3.3.2 Particularly Important Areas and Times for Marine Mammals and Sea Turtles, pg 294 - The identification and protection of critical habitat under SARA should be noted in these sections as well as 5.3.3.3 and 5.4.	<ul style="list-style-type: none"> • Information added to these sections
S261	\$5.3.3.2 Particularly Important Areas and Times for Marine Mammals and Sea Turtles, pg 294 – The Fish and Fish Habitat section included a Figure of identified important and sensitive areas (Figure 5.1).	<ul style="list-style-type: none"> • It did, because this information / specific locations for fish and fish habitat could be identified and mapped based on the information available. That is not the case for marine mammals and sea turtles • See above comment re moving of the initial Figure
S262	\$5.3.3.3 Summary of Environmental Planning Considerations for Marine Mammals and Sea Turtles, 2nd para., pg 295 - Given the previous comments, the following statement should be reviewed and supported because of its scope: “The presence of these species (<i>marine mammals and sea turtles</i>) can be considered in planning, proposing, reviewing and implementing any future oil and gas projects and activities (...). This, in combination with the general mitigation measures outlined above, including in particular the implementation of project specific marine mammals monitoring activities and avoidance protocols, will help to avoid or reduce any environmental (...) effects”.	<ul style="list-style-type: none"> • Text has been reworked slightly to address this item



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<p>S263</p> <p>§5.3.3.3 Summary of Environmental Planning consideration for Marine Mammals and Sea Turtles, pg 295 - A preliminary evaluation of potential impacts of seismic exploration on marine mammals from the Gulf of St Lawrence has recently been conducted by DFO in the context of the Quebec Government Strategic Evaluation of Impacts of Hydrocarbon Exploitation in the Gulf of St Lawrence. This evaluation was based on a quantitative approach of the number or proportion of population exposed to different levels of noise, and on objective criteria taking into account the conservation status of each population to assess magnitude and severity of impacts (Wood et al. 2012). Using local marine mammal mean densities (Lawson and Gosselin 2009; unpubl. data) with such an approach, we concluded that a small to medium-size seismic project (i.e., 1700 km²) could result in high impacts on several marine mammal species with a precarious conservation status, including blue whales, fin whales, and porpoises, as well as several other populations with no special conservation status such as minke whales, pilot whales and common short-beaked and white-sided dolphins. These conclusions were reached for a project conducted in July–August, i.e., during a period of high usage of the Gulf, but outside high density areas (as we used mean densities and not max densities of marine mammals in the calculations). This illustrates the high sensitivity of the Gulf ecosystem, and the need to better qualify, and in a quantitative way, potential impacts on marine wildlife prior to any seismic exploration in the Gulf of St Lawrence. The use of marine mammal densities specific to the period and area of interest would be particularly useful to assess impacts more accurately.</p> <p>So, while the statement in the SEA that '<i>potential environmental effects can be likely be addressed through project-specific planning and associated regulatory processes, through the identification and implementation of project and activity-specific mitigation and monitoring measures</i>', our analysis indicate that this may not necessarily be the case, even when areas of concentration of marine mammals are avoided.</p>	<ul style="list-style-type: none"> • This information and approach may well be useful in assessing (predicting) and evaluating and mitigating the effects of a proposed seismic survey project in an EA, but is beyond the focus and defined scope (and intent) of this SEA Update. • The last part of this comment contains the requested "action item", and we have addressed this through a slight wording change in the referenced section of the SEA Update Report. 	
<p>S264</p> <p>§5.3.4 Cumulative Environmental Effects, pg 296 - This section should also include the effects of other projects and oil and gas activities planned in adjacent (e.g. Gulf, province of Quebec) Gulf regions since migrating marine mammals may also have frequented these sites during their migration to and from the St. Lawrence estuary. This would qualify the following statement: '<i>the likely spatial and temporal distribution and short term nature of such projects, will limit the potential for interactions between the effects of these relatively isolated and intermittent sources of noise.</i>'</p>		<ul style="list-style-type: none"> • These and other sections on cumulative effects have been revised (wording) to make it clearer what is being referred to • The point here is that, in the cases of future oil and gas activities themselves, these projects and their effects will not likely overlap to results in cumulative effects.



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	Same comment as for the fish applies here. The decrease in the pH of the oceans vs. noise propagation.	<ul style="list-style-type: none"> The cumulative effects sections also clearly and integrally consider the effects of other past and on-going and future projects and activities in the region – such as fishing, vessel traffic etc.
S265	<p>§5.3.4 Cumulative Environmental Effects, 1st para., pg 296 - “...Based on previous studies, most potential effects to marine mammals and sea turtles as a result of seismic surveys and drilling programs occur within relatively close proximity to the noise source. Avoidance of an area by marine mammals or other effects as a result of a single seismic survey or drilling program would therefore likely be temporary in nature....”</p> <p>This is perhaps true for lethal or sublethal effects, but should be reviewed with regard to indirect effects including behavioural effects or those related to masking.</p> <p>This might no longer be true for large mysticetes or high-frequency odontocetes, which demonstrate high levels of behavioural reactions to noise at relatively low intensity (e.g., 120–140 dB re: 1 µPa (rms), see Wood et al. 2012). Using these levels, radii of insonification are multiplied by 10, and areas ensonified by 100. Therefore, areas of influence on behaviour might be much larger than what is implied by the statement above (of the order of 5000 km²).</p> <p>Impacts on marine mammals or any marine resources might be exacerbated if more than one project occurred at the same time or in succession, or within high-density areas during critical periods.</p>	<ul style="list-style-type: none"> Text and references have been revised to address the various comments and suggestions provided here (particularly, in the Table) – particularly examples of the distances at which marine mammals have been observed to alter their behaviors during seismic activity. The various issues raised by the reviewer around, for eg, species at risk, the effects of behavioral changes (from one or multiple / repeated projects) on use of key habitats and/or during key life history stages etc have also been incorporated into the discussion.
S266	§5.3.5 Information Availability and Requirements, 2nd para., last line, pg 296 – Replace “Petroleum Research Atlantic Canada (PRAC)” with “Petroleum Research Newfoundland & Labrador (PRNL)”.	<ul style="list-style-type: none"> Text has been edited as requested
S267	§5.3.5 Information Availability and Requirements, pg 296 – This section should highlight the lack of knowledge of areas supporting biologically essential behaviors for marine mammals, because it is a major challenge, especially for species at risk.	<ul style="list-style-type: none"> This issue has been referenced and incorporated in this section



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S268	<p>5.4 Protected and Sensitive Areas, pg 297 - <u>Gulf of St. Lawrence Integrated Management Area and Coastal Management Areas</u></p> <p>Recognizing the uniqueness and productivity and the need for large scale, coordinated planning and management, Fisheries and Oceans Canada has established the Gulf of St. Lawrence Integrated Management (GOSLIM) initiative to facilitate integrated management planning within the Gulf.</p> <p>The CNLOPB's Southern Newfoundland Strategic Environmental Assessment document included the GOSLIM area (as well as other Integrated Management Areas – Placentia Bay/Grand Banks, Eastern Scotian Shelf) as Potentially Sensitive Areas (see the Southern SEA report).</p> <p>Smaller scale integrated management areas – Coastal Management Areas (CMAs) - are also included as Potentially Sensitive Areas in the CNLOPB's Southern Newfoundland Strategic Environmental Assessment document. Three CMAs are located on the west coast of Newfoundland.</p> <p>Therefore, the GOSLIM area and CMAs should be considered Sensitive Areas and information should be included within this section of the SEA update document about the GOSLIM initiative and the Coastal Management Areas along the west Coast of Newfoundland - Bay St. George/Port aux Port, Bay of Islands and Great Northern Peninsula.</p> <p><u>Canadian Parks and Wilderness Association Special Marine Areas</u></p> <p>The Canadian Parks and Wilderness Association (CPAWS) has compiled a document entitled <i>Special Marine Areas of Newfoundland and Labrador</i> which has been referenced in the Sensitive Areas section of the CNLOPB's Southern Newfoundland SEA document.</p> <p>Several Special Marine areas have been identified by CPAWS along the west coast of Newfoundland. The CPAWS Special Marine Areas document should be referred to and areas identified should be included as Sensitive Areas in the SEA update document.</p>	<ul style="list-style-type: none"> A subsection on the GOSLIM area as well as other Integrated Management Areas has been added in the new Section 4.2.4 Information on the CMAs and the areas identified by CPAWS has been added in the new Section 4.2.4



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S269	<p>\$5.4.3 Environmental Planning Considerations, pgs 298-299 – It is great that sensitive areas beyond the SEA Update Area are recognized. Again, it would be useful if these were mapped.</p> <ul style="list-style-type: none"> • They mention Sable Island as a migratory bird area – FYI it's now a National Park Reserve as well. Also, just as for the Gully MPA, Sable Island isn't within the Gulf of St. Lawrence, so not sure why it's being mentioned. • The list in section 5.4.3 of terrestrial protected areas as the only sensitive areas for the purpose of this SEA update does not inspire confidence that there was a great analysis of marine ecosystem attributes and their sensitivities. Perhaps it would be worth having a look at the Quebec SEA for the Gulf which used a specific methodology to define areas in the marine environment? 	<ul style="list-style-type: none"> • Text revised to address re Sable Island • Gully and St Anns Bank have been mentioned generally and retained on Figure given base map area coverage, but text and table have been clarified to specify that these are not located within the Gulf itself. • Section 4.2.4 now includes considerable additional information on protected areas throughout the Gulf and associated maps
S270	<p>\$5.4.3 Environmental Planning Considerations, 4th para., pgs 299-300 – The information on hydraulic fracturing should have been presented earlier in the report. The discussion on potential effects should be moved to Section 5.4.1 Potential environmental Interactions and Effects.</p>	<ul style="list-style-type: none"> • This information has been added to the earlier section as requested
S271	<p>\$5.5.2 Environmental Mitigation Measures, pg 303 – Should account here for the comments on the fact that the efficiency/feasibility of the General mitigation measures for fish and wildlife habitat has not been discussed or actually demonstrated.</p>	<ul style="list-style-type: none"> • See earlier responses. • We have added discussions that recognize ongoing questions and uncertainty around the effectiveness of select measures, in order to recognize in the analysis that it is not necessary a given that all such measures will be 100% effective in all circumstances. • We suggest that this "recognition" fits best in the "data gaps" section for each relevant VEC, and have therefore included it there (as agreed with C-NLOPB)
S272	<p>\$5.5.2 Environmental Mitigation Measures, pg 304 – Replace the second paragraph that begins with "In Newfoundland and Labrador..." with "In the province of Newfoundland and Labrador, a unique model has been developed to facilitate effective communication between the offshore fishing and petroleum sectors. In 2002, One Ocean was established as a voluntary, inter-industry liaison organization providing a neutral and practical medium for information exchange. The model promotes mutual awareness and understanding of industry operational activities and its proactive approach to address areas of potential concern is enhanced through its commitment to cooperation and transparency."</p>	<ul style="list-style-type: none"> • Text has been updated (replaced) as requested



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REVIEW COMMENTS		WHERE / HOW ADDRESSED
<p>The organization consists of a Chairperson, Director, Industry Board and Working Group. The One Ocean Industry Board is a core component of the organization and is comprised of equal, senior-level representation from the two industry sectors. Fishing industry members are represented by the Fish, Food and Allied Workers (FFAW) union and the Association of Seafood Producers (ASP). Petroleum industry members are affiliates of the Canadian Association of Petroleum Producers (CAPP). Official Observers on the Board include the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB), Fisheries and Oceans Canada (DFO), the Fisheries and Marine Institute of Memorial University of Newfoundland (Marine Institute) and the Canadian Coast Guard (CCG). Please see http://www.oneocean.ca <http://www.oneocean.ca> for more information."</p>		
S273	<p>Section 7 References, pg 342 – The reference to "Scandpower (2006). <i>Blowout and well release frequencies - based on SINTEF offshore blowout database (Report No. 90.005.001/R2). Kjeller, Norway: Scandpower Risk Management.</i>" This report is not generally available and should be removed unless it has been reviewed by AMEC.</p>	<ul style="list-style-type: none"> • A more recent Scandpower report. (2010) has been accessed and added to the report.
S274	<p>Section 7 References, pg 344 – The "Stantec (2011)" report is frequently referenced throughout the report. This report has not been finalized and content and assertions made can change. Information cited should be checked for accuracy.</p>	<ul style="list-style-type: none"> • All text on previous oil spill modeling in the Western NL Offshore Area has been removed from the SEA Update Report, as requested by the C-NLOPB. • Other information from that EA has been used very generally (recognizing that the EA results have yet to be finalized)
Editorial Comments:		
E1	Cover, Figure – Delete "Port Au Choix" from figure on cover and throughout report.	• Deleted on all Figures as requested
E2	"Aboriginal consultation" should be "Aboriginal engagement" throughout the report.	• Deleted on all Figures as requested
E3	§2.2.1.1 Equipment and Methods, 1st para., line 5, pg 15 – Replace "with" with "which".	• Text revised throughout the report as requested
E4	§2.2.1.3 Other Emissions and Potential Accidental Events and Malfunctions, 2nd para., last line, pg 19 – Delete the first "environment".	• Text deleted as requested
E5	§2.2.2.4 Hydraulic Fracturing Activities, 3rd para., line 4, pg 25 – Delete "be".	• Text deleted as requested
E6	§2.2.2.6 Potential Accidental Events and Malfunctions, Table 2.10, pg 38 - The short-form for Newfoundland used in the report is NFLD. This form is expired and the appropriate form is NL.	• Text revised here and throughout, as requested

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	REVIEW COMMENTS	WHERE / HOW ADDRESSED
	Please ensure NL is used throughout the report.	
E7	\$2.2.2.7 Oil Spill Prevention and Response, 2 nd para., line 2, pg 40 - An incomplete sentence "... operators are required to demonstrate that <i>they</i> have the ability and capacity ..." emphasised word is missing in text.	<ul style="list-style-type: none"> Text revised as requested
E8	\$2.4 Potential Future Offshore Exploration Activities, 6 th para., line 1, pg 48 – Delete the first "in the".	<ul style="list-style-type: none"> Text deleted as requested
E9	\$2.4 Potential Future Offshore Exploration Activities, 6 th para., line 5, pg 48 – Delete the second "also".	<ul style="list-style-type: none"> Text deleted as requested
E10	\$3.4.4.1 Environmental and Human Setting, 1 st bullet, pg 64 – This should read, "as well as".	<ul style="list-style-type: none"> Text revised as requested
E11	\$3.4.4.2 Environmental Considerations and Possible Mitigation, 1 st bullet, pg 64 – Should this read, "... an oil spill..."	<ul style="list-style-type: none"> Text revised as requested
E12	\$3.5 Identification of Valued Environmental Components, 1 st para., line 3 – Delete "etc".	<ul style="list-style-type: none"> Text deleted as requested
E13	\$4.1.1.5 Coastal Geomorphology, 5 th para., pg 85 – It should be "within" not "withn" seven parameters AND delete the comma before "each" after the bullet list.	<ul style="list-style-type: none"> Text revised as requested
E14	\$4.1.3.1 Wind Conditions, last para., last line, pg 92 – " <i>Tables that follow</i> ". The table numbers should be referenced in the text. Also, Table 4.5 appears before it is referenced in the text.	<ul style="list-style-type: none"> Table references and ordering addressed in the text
E15	\$4.1.3.2 Air Temperatures, 1 st paragraph, 2 nd sentence, pg 100 – Is 1662 correct?	<ul style="list-style-type: none"> Yes, it is correct – see http://icoads.noaa.gov/products.html
E16	\$4.1.4.1 Ocean Currents, 3 rd para., pg 110 – There are references to the Laurentian and Esquiman Channels. They should be identified in Figure 4.18.	<ul style="list-style-type: none"> Added to Figure
E17	\$4.2.1.1 DFO Multi-Species Surveys, 1 st para., 1 st sentence, pg 125 – Semi-colons should be used if you start a list in a paragraph with a colon. Also, a new paragraph is warranted after the list ("...and the herring acoustic surveys."	<ul style="list-style-type: none"> Text revised as requested
E18	\$4.2.1.3 Benthos and Coastal Habitats, Table 4.32, pg 132 – It should be "Barachois"	<ul style="list-style-type: none"> Text revised as requested
E19	\$4.2.1.3 Benthos and Coastal Habitats, Coastal/Intertidal and Subtidal Communities <i>Intertidal Community</i> , last sentence, pg 132 – Change "important economically" to "economically important" or add a comma after "important."	<ul style="list-style-type: none"> Text revised as requested
E20	\$4.2.1.3 Benthos and Coastal Habitats, Estuaries, 1 st para., 2 nd sentence, pg 136 – Delete the word "are".	<ul style="list-style-type: none"> Text deleted as requested
E21	\$4.2.1.4 marine Fish (Invertebrate and Finfish Species), Summary of Some Key Spawning Times and Areas, Table 4.36, pg 150 – The redfish column appears incomplete.	<ul style="list-style-type: none"> Information added to complete this section



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E22	\$4.2.1.5 Regional Marine Fish Distributions, Finfish Species, 3rd para., 3rd sentence, pg 163 – “ ... redfish appear to do primarily for feeding...” does not make sense.	<ul style="list-style-type: none"> Text revised as requested
E23	\$4.2.1.7 Identified Important and Sensitive Areas for Fish and Fish Habitat, Marine Protected Areas (MPAs)/Areas of Interest (AOI), 1st para., last sentence, pg 189 – Should this read, “ ... formally designate them as MPAs.”	<ul style="list-style-type: none"> Text revised as requested
E24	\$4.2.2.1 Seabirds, Figure 4.51, pg 193 – The colours in the legend are difficult to follow, particularly the light blue for no data and usually, darker shades of a colour are used to represent increased or high densities.	<ul style="list-style-type: none"> Figures revised as requested
E25	\$4.2.3 Shorebirds, 1st sentence, pg 207 – Should this read, “ ... are most abundant during summer and fall migration...” as you continue July to September.	<ul style="list-style-type: none"> Text revised as requested
E26	\$5.1.2 Environmental Mitigation Measures, 2nd para., line 2, pg 274 – “efefcts” should be “effects”.	<ul style="list-style-type: none"> Text revised as requested
E27	\$5.1.3.2 Important Areas and Times for Fish and Fish Habitat, Figure 5.1, pg 278 – What does the large rectangle represent? It needs to be included in the legend.	<ul style="list-style-type: none"> Added as requested
E28	\$5.1.4 Cumulative Environmental Effects, 1st para., line 3, pg 279 – Delete “others”.	<ul style="list-style-type: none"> Text deleted as requested
E29	\$5.5.2 Environmental Mitigation Measures, 2nd para., line 5, pg 305 – Replace “C-NOLPB’s” with “C-NLOPB’s”.	<ul style="list-style-type: none"> Text revised as requested
E30	\$5.6 Potential Effects of the Environment on Oil and Gas Activities, 4th para., line 2, pg 307 – Replace “that” with “than”.	<ul style="list-style-type: none"> Text revised as requested
Appendix A		
Western NL Offshore Area SEA Update - Consultation Report		
A1	\$2.2 Public Open Houses, 1st para., line 3, pg 9 – Delete “which made proceeding with the traditional open house format at the onset somewhat challenging”.	<ul style="list-style-type: none"> Text deleted as requested
A2	\$2.4 Correspondence and Meetings with Aboriginal Groups, line 2, pg 12 – Delete the following text “requesting meetings and dialogue, specifically the: <ul style="list-style-type: none"> Innu Council of Ekuanitshit (Quebec) Millbrook First Nation (Nova Scotia) Mi’gmawei Mawiomí Secretariat (Quebec)” 	<ul style="list-style-type: none"> Text deleted as requested
A3	\$3.1.1 Port aux Basques, Public Open House, pg 13 - There was a question raised about access to previous information with regard to the use of materials acquired in the past to be used by those exploring today. Might do with the explanation of processes with the C-NLOPB and business	<ul style="list-style-type: none"> Information added as requested



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REVIEW COMMENTS		WHERE / HOW ADDRESSED
confidentiality in the exploration environment.		
A4	§3.1.1 Public Open House, 6th bullet, pg 14 – Should this read, “A need to ensure that...”?	<ul style="list-style-type: none"> Text revised and information added as requested
A5	There was indication of a perspective that petroleum industry represents an economic opportunity for the few. Further there was concern that seismic and/or blasting on the grounds effects what is in the pots.	<ul style="list-style-type: none"> Text revised and information added as requested
A6	§3.2.2 Stephenville, Stakeholder Meeting, 3rd bullet, pg 18 – Repeat of the word “economically”.	<ul style="list-style-type: none"> Text deleted as requested
A7	§3.2.2 Stephenville, Stakeholder Meeting, pg 18 – A participant indicated observing crude oil while doing contract work and questioned natural seepage in the Gulf of St. Lawrence environment.	<ul style="list-style-type: none"> Information added as requested
A8	§3.3.2 Corner Brook, Public Open House, pg 19 – The question was asked – How can the C-NLOPB ensure that activity does not impact on some/all/any stocks?	<ul style="list-style-type: none"> Information added as requested
A9	§3.3.2 Corner Brook, Stakeholder Meeting, pg 23 – There was a comment on the potential problem of the composition of the working group for the SEA.	<ul style="list-style-type: none"> Information added as requested
A10	§3.4.2 Rocky Harbour, Stakeholder Meeting, pg 27 – A comment that science is showing a decrease in female crab abundance in the Gulf of Mexico since the Macondo spill took place. On the bullets on environmental monitoring it was indicated that it should not be industry associated and it should be made publicly available.	<ul style="list-style-type: none"> Information added as requested (partially covered in previous text)
A11	§3.4.2 Rocky Harbour, Stakeholder Meeting, 8th bullet, pg 28 – It was indicated that it should not be industry associated and it should be made publicly available.	<ul style="list-style-type: none"> Text somewhat unclear – But additional information added here on these themes.
A12	§3.10.3 Meeting With Innu Council of Ekuanitshit, pg 49 & §3.11.3 Subsequent Meeting with the Migmawei Mawioimi Secretariat (Nov 26 2012), pg 54 - There is no indication of how C-NLOPB/AMEC responded to concerns raised by Aboriginal groups at the meetings, nor how C-NLOPB/AMEC will consider these concerns moving forward.	<ul style="list-style-type: none"> The consultation report provides an “inventory” of the questions and concerns heard throughout the consultation process. It does not indicate C-NLOPB’s responses etc – And it is not clear why it would do so for only this specific group.
A13	§3.11.3 Subsequent Meeting with the Migmawei Mawioimi Secretariat (Nov 26 2012), pg 54 - It was stated that the Gulf belongs to the local Mi’gmaq communities, who have <u>title</u> to a commercial fishery for snow crab and shrimp in the <u>area</u> . It was also stated that there is a spiritual side to this fishery.” EC would suggest checking on the use of the word “title” in this context, as “rights” may be more appropriate. Furthermore, it may be desirable to better define “area”.	<ul style="list-style-type: none"> Text revised as requested (Rights) The “area” was not defined by the speaker, and so we cannot be more specific about this here

Western NL Offshore Area SEA Update – Draft Report # 2 (April 2013)
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REVIEW COMMENTS		WHERE / HOW ADDRESSED
A14	<p>§3.11.3 Subsequent Meeting with the Migmawei Mawioimi Secretariat (Nov 26 2012), pg 54 -</p> <p>Concerns were expressed about oil and gas projects in the Gulf, and a moratorium was requested until the environment is better understood (which may take 10 – 12 years). A moratorium resolution on offshore oil and gas in the Gulf of St. Lawrence was reportedly passed in the <u>community</u>." Given the participation of several Mi'gmaq groups at this meeting, it is not clear which Mi'gmaq community has passed the moratorium resolution, or if the resolution was instead passed at the Mi'gawei Mawioimi Secretariat level.</p>	<ul style="list-style-type: none"> The source of the resolution was not defined by the speaker, and so we cannot be more specific about this here.



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MARINE FISHERIES

REVIEW COMMENTS	WHERE / HOW ADDRESSED
Specific Comments by Section and/or Page Number:	
<p>4.3.5.1 Data Areas and Sources</p> <p>Page 1 – Last line. Note there are NAFO divisions, sub-divisions and Unit Areas- 3Pn is a NAFO sub-division</p> <p>Page 4 – Policy and Economics Branch NL Region has provided suggested re-wording of portion of Page 4. This re-wording is included as a separate file attachment.</p> <p>In Addition, it should be noted that specific latitude and longitude catch information are generally not available for the vessels <40'. This is not to suggest that the location and amount of the catch is not recorded in DFO databases. These smaller vessels are required to report unit area fished. Therefore, when presenting maps of predominately inshore fisheries the reader may be left with the impression that there is limited catch (i.e. no green blocks). It may be useful to indicate ported landed as a proxy for area fished. Landings ports and fishing grounds should be in relatively close proximity for many inshore fisheries (e.g. Lobster).</p>	<ul style="list-style-type: none"> • Text and relevant Figures been revised throughout this section to correctly reference NAFO Divisions, Sub-Divisions and Unit Areas • Text has been revised as applicable to address DFO suggested wording • Information on port of landing has not been provided and therefore cannot be included. The text has attempted to be clear that the geospatial dataset is not necessarily comprehensive for all types of fishing activity, esp for smaller vessel and inshore fisheries. This is similar to the 2005 SEA.
<p>4.3.4.2.2 Commercial Fisheries</p> <p>In general, the report needs to provide more detail to allow the reader to distinguish between “caught in” versus “landed in” specific geographies. (i.e. are the statistical table reporting fish has was caught in \$R or fish that was landed in \$R from this and other NAFO areas).</p> <p>Page 9, Table 4.2 – There are no data provided for seal skins in 2011 but DFO Quebec region have record of 4,679 animals harvested by Newfoundland and Labrador vessels in the Gulf that Year.</p> <p>Page 46, Table 4.11 – Please clarify if the figures for 2005-2011 are meant to be average, cumulative or something else?</p> <p>Page 47 – Near the bottom it says “Note that where fishing activity occurred in multiple years within a single grid square, the most recent year is indicated).” This comment is confusing and not apparent in the figures that appear to present data only from 2011. Can this be clarified?</p>	<ul style="list-style-type: none"> • Text has been added / revised to be clear that the DFO dataset reflects “where caught” • The report correctly presents the DFO data as received from the Department in early 2013. The SEA cannot attempt to reconcile any apparent or reported discrepancies between the DFO National and Regional databases. • The values in these Tables are meant to be “total” for 2005-2011, as reflected in earlier data tables in the report. The word “Total” has been added throughout these Tables to highlight this. • “Note that where fishing activity occurred in



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<p>Page 54 – same comment as for page 47</p> <p>Page 58 – Table 4.13 contains confusing information similar to that noted for page 46 Table 4.11 (comment above).</p> <p>Sealing Page 63, There has been significant growth in overall seal populations in the Gulf Region since 2005 (NLDFA 2012a), although the provincial seal harvest (landings) has declined by over 40 percent due to animal rights controversies and international pressure resulting in poor market conditions (NLDFA 2012b). The harp seal population has nearly tripled in size – from less than two million animals in the 1970s to more than five million today. The current population estimate is 7 million.</p> <p>Last paragraph – With regard to “value” – Is it different than pelt prices? I.e. does it refer to quality?</p>	<p>multiple years within a single grid square, the most recent year is indicated).” – Because the data could only be provided for grid cells for individual years by DFO we had to map these years together through a series of maps that inevitably include “overlapping” data / years. The note on the Figures reflects this, in that where data for multiple years overlap in a grid cell, only the most recent year is shown in the colour coding (we had to pick one).</p> <ul style="list-style-type: none"> • This has been reflected / reiterated some additional times in the text to make it clearer. • Sealing text revised slightly to address
<p>4.3.5.4 Recreational Marine Fisheries</p> <p>Page 66 the reference to “scheduled” waters will be familiar to sport fishers but is it apparent to all? Should this explain that it means fly fishing only? In addition, the referenced Gardner Pinfold document refers to the economic value of recreational salmon fisheries so that information should be included.</p>	<ul style="list-style-type: none"> • Text has been revised slightly to address this terminology, and additional information on value of fishing from the referenced report has been added.

Meade, James

From: Veinott, Geoff
Sent: August-13-13 2:56 PM
To: Meade, James
Cc: Grant, Carole
Subject: RE: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline Sept 12th

Jim, I'm ok with the responses to the concerns around Atlantic Salmon, but others in our section may have additional comments.
Geoff

From: Meade, James
Sent: August 13, 2013 2:25 PM
To: Anderson, M. Robin; Clarke, Keith; Dalley, Kate L; Lawson, Jack; Power, Don; Veinott, Geoff; Payne, Jerry F
Cc: Richards, Dale E; Grant, Carole; Stenson, Garry; Mansour, Atef A H; Parrill, Erika; Abbott, Melissa H
Subject: RE: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline Sept 12th

Hey Folks,
Please find attached the Table of Concordance on Draft #1 of the WNL SEA Update to aid in your review.
If you have any questions, please let me know.
<< File: 2013 05 16 - AMEC Western NL Offshore Ar~of Concordance with C-NLOPB and....docx >>
Cheers,
Jim

From: Richards, Dale E
Sent: August-09-13 12:09 PM
To: Anderson, M. Robin; Clarke, Keith; Dalley, Kate L; Lawson, Jack; Power, Don; Veinott, Geoff; Payne, Jerry F
Cc: Grant, Carole; Stenson, Garry; Mansour, Atef A H; Meade, James; Parrill, Erika; Abbott, Melissa H
Subject: RE: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline Sept 12th

s.19(1)

Hi all,

Please send any comments on this request to Jim. He will be coordinating the review, 

Thank you,
Dale

From: Richards, Dale E
Sent: July 25, 2013 4:14 PM
To: Anderson, M. Robin; Clarke, Keith; Dalley, Kate L; Lawson, Jack; Power, Don; Veinott, Geoff; Payne, Jerry F
Cc: Grant, Carole; Stenson, Garry; Mansour, Atef A H; Meade, James; Parrill, Erika; Abbott, Melissa H; McCallum, Barry; Davis, Ben
Subject: RE: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline Sept 12th

Good afternoon,

Please note that the CSA deadline for submission of comments pertaining to the review of the revised Western NL Offshore SEA will be September 12th. The Quebec and Gulf Regions will be completing their own separate reviews of this file. This approach is consistent with the initial review completed in late January 2013.

If you have any questions, please give me a call.

Dale

From: Richards, Dale E
Sent: July 8, 2013 3:08 PM
To: Anderson, M. Robin; Clarke, Keith; Dalley, Kate L; Lawson, Jack; Power, Don; Veinott, Geoff
Cc: Grant, Carole; Stenson, Garry; Mansour, Atef A H; Meade, James; Parrill, Erika; Davis, Ben; McCallum, Barry
Subject: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline TBA

Good afternoon,

Please note the draft "*Western Newfoundland and Labrador Offshore Area Strategic Environmental Assessment (SEA) Update*" (AMEC May 2013) has been posted on the CNLOPB website (<http://www.cnlopb.nl.ca/wnlsea.shtml>). This draft report incorporates comments received during the review of the preliminary draft report that Science was asked to provide comments on in Jan 2013. For your reference, I have attached the Science memo directed to Ecosystems Management and copied the designated Scientists who provided input directly into that January response.

<< File: Western NL SEA update.pdf >>

The information is also available in a FTP Folder (<ftp://ftp1.dfo-mpo.gc.ca/GullageM/>) and I will copy all the information required for this subsequent review to the CSA folder on the shared Science drive later today.

The original deadline received with this request for Science advice was the end of July; however, I have asked that Ecosystems Management reassess that deadline and provide an extension. To that end, I will advise when a new deadline has been established; however, in the interim I am forwarding the information to your attention.

If you have any question, please give me a call.

Dale

E. Dale Richards, B.Sc. Hons., M.Sc.

Centre for Science Advice / Centre des avis scientifiques

Newfoundland and Labrador Region / La Région de Terre-Neuve et du Labrador

Fisheries and Oceans Canada / Pêches et Océans Canada

80 East White Hills Road, PO Box 5667, St. John's, NL A1C 5X1

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Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO

<http://www.dfo-mpo.gc.ca/csas-sccs/>

Meade, James

From: Dalley, Kate L
Sent: August-15-13 2:33 PM
To: Meade, James
Cc: Clarke, Keith
Subject: RE: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline Sept 12th

Hi Jim,

I have reviewed the updated material in the Western NL Offshore Area Strategic Environmental Assessment Update, May 2013. I am comfortable that the items of concern that I identified in the previous review have been adequately addressed.

Please let me know if you require additional information or have questions.

Cheers,
Kd

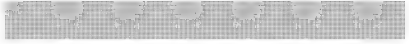
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Cc: Richards, Dale E; Grant, Carole; Stenson, Garry; Mansour, Atef A H; Parrill, Erika; Abbott, Melissa H
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Sent: August-09-13 12:09 PM
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Cc: Grant, Carole; Stenson, Garry; Mansour, Atef A H; Meade, James; Parrill, Erika; Abbott, Melissa H
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Sent: July 8, 2013 3:08 PM
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Cc: Grant, Carole; Stenson, Garry; Mansour, Atef A H; Meade, James; Parrill, Erika; Davis, Ben; McCallum, Barry
Subject: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline TBA

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<< File: Western NL SEA update.pdf >>

The information is also available in a FTP Folder (<ftp://ftp1.dfo-mpo.gc.ca/GullageM/>) and I will copy all the information required for this subsequent review to the CSA folder on the shared Science drive later today.

The original deadline received with this request for Science advice was the end of July; however, I have asked that Ecosystems Management reassess that deadline and provide an extension. To that end, I will advise when a new deadline has been established; however, in the interim I am forwarding the information to your attention.

If you have any question, please give me a call.

Dale

E. Dale Richards, B.Sc. Hons., M.Sc.
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Newfoundland and Labrador Region / La Région de Terre-Neuve et du Labrador
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Visit the Canadian Science Advisory Secretariat of DFO / Visitez le Secrétariat Canadien de Consultation Scientifique du MPO
<http://www.dfo-mpo.gc.ca/csas-sccs/>

Meade, James

From: Lawson, Jack
Sent: September-10-13 12:19 PM
To: Meade, James; Stenson, Garry
Subject: FW: Request for Science Advice: Western NL Offshore SEA Update - revised document
- for input and comment: Deadline Sept 12th

Here's the attachment.



AMEC-C-NLOPB
Western NL EA ...

From: Lawson, Jack
Sent: September 10, 2013 12:18
To: Meade, James
Cc: Stenson, Garry; Sjare, Becky
Subject: RE: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and
comment: Deadline Sept 12th

Hi Jim,

Attached is my review of the updated SEA. It has been improved, although on a few of the larger-scale issues like cumulative impacts, I think they ducked the issue more than they should.

regards, Jack

s.21(1)(b)

Lawson (Marine Mammal Section, DFO) Review of “Western Newfoundland & Labrador Offshore Area Strategic Environmental Assessment Update” By C-NLOPB.

- Section 5.1, also p. 64, 117 – While “Several paragraphs have been added at the end of the ‘Previous Spills in the NL Offshore Area’ section... Additional discussion of this issue has also been added to Chapter 5 (under Fish and Fish Habitat, as it is the first relevant section)”, the response to the Science query about under-ice oil spills and fates remains a general response with only vague assurances that if the issue is new or important the C-NLOPB will consider implementing additional spill response technology. While it is understood that this is a SEA and that additional detail might be provided in project-specific EAs, nonetheless the updated SEA does not provide an adequate discussion of the difficulties of under-ice oil detection and recovery which would then provide the background for more detailed project-specific EAs. Despite the Gulf having potentially less sea ice as a result of climate change, the ice that remains is dynamic and unpredictable due to factors such as storm winds. Mention of “on-going C-NLOPB reviews” do not clarify the issues given the lack of timelines and scope for these.
- Science is generally satisfied with the new text and edits used to address Science concerns about marine mammal and sea turtle information descriptions.
- As referred in Science comments S238, S264, S265, Science reiterates that future EAs must take into account the possibility of cumulative effects from multiple concurrent projects, or additive impacts from a sequence of multiple projects. It is premature at the SEA stage to conclude that there will be no cumulative impacts when the authors themselves repeatedly state that more in-depth analyses will be undertaken in subsequent, project-specific EAs.
- As referred in Science comment S258, Science is pleased that the revised SEA acknowledges the potential benefits of using trained observers and more clearly-described monitoring methods. Science reiterates the need to collect the number of hours of ON EFFORT duty needed to collect sightings data.
- In response to Science question S257, the AMEC response is “At this stage we have been instructed to not provide any such recommendations for new or additional mitigation until the SEA process is further advanced”. Instructed by who? If by the C-NLOPB, for example, a clear rationale must be provided as to why, at the least, recommendations could not be made for what is supposed to be a broad-scope SEA. Again, a class-screening document for seismic and other offshore activities does not exist for Newfoundland and Labrador, and an update of the class screening document for Nova Scotia is long overdue.

Meade, James

From: Power, Don
Sent: September-11-13 11:40 AM
To: Meade, James
Subject: RE: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline Sept 12th

Hi Jim,

I'm not sure if the proponents response to **S238** is adequate. Perhaps other have already piped in on this one as it appears several people may have commented on this in the review. I guess it is a procedural matter to check on with Habitat Management? Part of the response was basically:

In general, and as per the SEA as a whole, the intent is not to assess (predict) effects, but rather, identify planning issues etc.

They state the effects are not likely to occur because the drilling/seismic will be separated in space and time. Is this adequate?

Don

From: Meade, James
Sent: September 9, 2013 9:55 AM
To: Anderson, M. Robin; Clarke, Keith; Dalley, Kate L; Lawson, Jack; Power, Don; Veinott, Geoff; Payne, Jerry F
Cc: Grant, Carole; Stenson, Garry; Mansour, Atef A H; Parrill, Erika; Abbott, Melissa H; Richards, Dale E
Subject: RE: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline Sept 12th

Good Morning Folks,

I've heard from some of you already – thanks.

For others, just a friendly reminder that comments regarding the above review are due Thursday.


Thanks and Cheers,

Jim

From: Richards, Dale E
Sent: August-09-13 12:09 PM
To: Anderson, M. Robin; Clarke, Keith; Dalley, Kate L; Lawson, Jack; Power, Don; Veinott, Geoff; Payne, Jerry F
Cc: Grant, Carole; Stenson, Garry; Mansour, Atef A H; Meade, James; Parrill, Erika; Abbott, Melissa H
Subject: RE: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline Sept 12th

s.19(1)

Hi all,

Please send any comments on this request to Jim. He will be coordinating the review, 

Thank you,
Dale

From: Richards, Dale E
Sent: July 25, 2013 4:14 PM
To: Anderson, M. Robin; Clarke, Keith; Dalley, Kate L; Lawson, Jack; Power, Don; Veinott, Geoff; Payne, Jerry F
Cc: Grant, Carole; Stenson, Garry; Mansour, Atef A H; Meade, James; Parrill, Erika; Abbott, Melissa H; McCallum, Barry; Davis, Ben
Subject: RE: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline Sept 12th

Good afternoon,

Please note that the CSA deadline for submission of comments pertaining to the review of the revised Western NL Offshore SEA will be September 12th. The Quebec and Gulf Regions will be completing their own separate reviews of this file. This approach is consistent with the initial review completed in late January 2013.

If you have any questions, please give me a call.

Dale

From: Richards, Dale E
Sent: July 8, 2013 3:08 PM
To: Anderson, M. Robin; Clarke, Keith; Dalley, Kate L; Lawson, Jack; Power, Don; Veinott, Geoff
Cc: Grant, Carole; Stenson, Garry; Mansour, Atef A H; Meade, James; Parrill, Erika; Davis, Ben; McCallum, Barry
Subject: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline TBA

Good afternoon,

Please note the draft "*Western Newfoundland and Labrador Offshore Area Strategic Environmental Assessment (SEA) Update*" (AMEC May 2013) has been posted on the CNLOPB website (<http://www.cnlopb.nl.ca/wnlsea.shtml>). This draft report incorporates comments received during the review of the preliminary draft report that Science was asked to provide comments on in Jan 2013. For your reference, I have attached the Science memo directed to Ecosystems Management and copied the designated Scientists who provided input directly into that January response.

<< File: Western NL SEA update.pdf >>

The information is also available in a FTP Folder (<ftp://ftp1.dfo-mpo.gc.ca/GullageM/>) and I will copy all the information required for this subsequent review to the CSA folder on the shared Science drive later today.

The original deadline received with this request for Science advice was the end of July; however, I have asked that Ecosystems Management reassess that deadline and provide an extension. To that end, I will advise when a new deadline has been established; however, in the interim I am forwarding the information to your attention.

If you have any question, please give me a call.

Dale

E. Dale Richards, B.Sc. Hons., M.Sc.

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<http://www.dfo-mpo.gc.ca/csas-sccs/>

Richards, Dale E

De: Payne, Jerry F
Envoyé: September-12-13 6:31 PM
À: Richards, Dale E
Objet: FW: Western Newfoundland Strategic Environmental Assessment

Sorry Dale--also for you!

Jerry

From: Payne, Jerry F
Sent: September 12, 2013 6:29 PM
To: Meade, James
Cc: Clarke, Keith; Mansour, Atef A H; Lawson, Jack; Andrews, Catherine; Anderson, M. Robin; Gregory, Robert
Subject: Western Newfoundland Strategic Environmental Assessment

Hi Jim

I am forwarding a generic statement. Jack, please note, as usual, that I only touch the fish/seismic issue, the marine mammals being in your court.

The Report mainly covers the natural environment but environmental issues and knowledge gaps are also to be covered in a SEA. Both issues and knowledge gaps are commonly only discussed in a broad manner in a SEA, putatively with the understanding that in the event of oil discovery and potential production at a specific site, a major Environmental Impact Statement (EIS) has to be submitted to the CNLOPB. (In the case of the Gulf of St Lawrence, an EIS may also be required for exploratory drilling.)It is considered important that an EIS focus on potential risks to microbial communities, invertebrates, fish and fisheries in much greater detail than found in SEA reports.Perspective on the actual magnitude of risks and recovery associated with oil spills and potential discharges of produced waters and drilling muds is all important.Understandably, provision of such a perspective requires review and interpretation of a considerable literature base.

There is presently no drilling in the Gulf but seismic surveys are slated for the near future.There is increasing stated caution and concern by agencies and scientists about the unknown effects of high sound pressures on fish and shellfish.For instance,in a review carried out by the Bureau of Ocean Management in the USA, note was especially made with respect to the major knowledge for crustaceans as well as fish. It follows that due to this major knowledge gap, it is not possible to provide informed scientific opinion on the degree of any potential risks of seismic surveys.Thus it is very important that this knowledge gap be addressed.

Thanks.

Jerry

Jerry F. Payne Ph.D
Research Scientist
Science Branch
Department of Fisheries and Oceans
80 East White Hills Road, P.O. Box 5667
St. John's, NL
Canada
A1C 5X1
Ph: (709) 772-2089
Fax: (709) 772-5315
jerry.payne@dfo-mpo.gc.ca

Meade, James

From: Anderson, M. Robin
Sent: September-13-13 2:35 PM
To: Meade, James
Cc: Clarke, Keith
Subject: RE: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline TBA

Hi Jim,
Please find attached my review of the second draft of the Western NL SEA. This draft is a great improvement. In fact I think it is one of the best I have read.
Let me know if you have any questions.
Robin
PS have a good weekend



Review of the
Western Newfo...

M. Robin Anderson, PhD
Marine Habitat Research Scientist
Ecological Sciences Section
Environmental Science Division
Science Branch, Fisheries and Oceans Canada
POBox 5667
St. John's, NL A1C 5X1
CANADA
ph:709-772-0460
fax:709-772-5315
email:m.robin.anderson@dfo-mpo.gc.ca

From: Richards, Dale E
Sent: July 8, 2013 3:08 PM
To: Anderson, M. Robin; Clarke, Keith; Dalley, Kate L; Lawson, Jack; Power, Don; Veinott, Geoff
Cc: Grant, Carole; Stenson, Garry; Mansour, Atef A H; Meade, James; Parrill, Erika; Davis, Ben; McCallum, Barry
Subject: Request for Science Advice: Western NL Offshore SEA Update - revised document - for input and comment: Deadline TBA

Good afternoon,

Please note the draft "*Western Newfoundland and Labrador Offshore Area Strategic Environmental Assessment (SEA) Update*" (AMEC May 2013) has been posted on the CNLOPB website (<http://www.cnlopb.nl.ca/wnlsea.shtml>). This draft report incorporates comments received during the review of the preliminary draft report that Science was asked to provide comments on in Jan 2013. For your reference, I have attached the Science memo directed to Ecosystems Management and copied the designated Scientists who provided input directly into that January response.

<< File: Western NL SEA update.pdf >>

The information is also available in a FTP Folder (<ftp://ftp1.dfo-mpo.gc.ca/GullageM/>) and I will copy all the information required for this subsequent review to the CSA folder on the shared Science drive later today.

The original deadline received with this request for Science advice was the end of July; however, I have asked that Ecosystems Management reassess that deadline and provide an extension. To that end, I will advise when a new deadline has been established; however, in the interim I am forwarding the information to your attention.

If you have any question, please give me a call.

Dale

E. Dale Richards, B.Sc. Hons., M.Sc.

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**Review of the Western Newfoundland & Labrador Offshore Area Strategic
Environmental Assessment Update Draft #2**

By M. Robin Anderson

September 13th, 2013

As requested, I have reviewed the **Western Newfoundland & Labrador Offshore Area Strategic Environmental Assessment Update Draft #2** and have the following comments.

This draft of the SEA update is a significant improvement over the first one. The authors have responded well to the reviewers' comments. The document is now updated with recent and relevant research and survey data. In particular the section on Approach and key information sources 4.2.1.1 is an excellent summary and rationale for the ecosystem approach with references that relate directly to the SEA area. The plankton section is also well done – probably the most comprehensive I have seen in these reviews.

One question that occurred to me when reading the sensitive areas sections is that in the Western Newfoundland SEA area, there are a number of places where oil and gas development will not be permitted. Gros Morne National Park would be an example. These “no go” areas should be identified.

P 178 Table 4.4.1 *Membranipora* and Rainbow trout have also been found in the study area.

If you have any questions about these comments or require additional information, please do not hesitate to contact me.

Robin Anderson

Meade, James

From: Carroll, Marlene
Sent: September-20-13 2:06 PM
To: Finn, Ray
Cc: Mansour, Atef A H; Anderson, M. Robin; Lawson, Jack; Payne, Jerry F; Power, Don; Abbott, Melissa H
Subject: Emailing: Finn memo West NL offshore (SEA).pdf
Attachments: Finn memo West NL offshore (SEA).pdf

Attached for your information is a memo to Ray Finn from Regional Director Science re: Review of the Western Newfoundland & Labrador Offshore Area Strategic Environmental Assessment Update".

Marlene Carroll
Administrative Assistant
Regional Director's Office
Science Branch, NL Region
e-mail: Marlene.Carroll@dfo-mpo.gc.ca
(709)772-2027



Fisheries and Oceans
Canada

Pêches et Océans
Canada

MEMORANDUM

NOTE DE SERVICE

To
À R. Finn
Regional Director Ecosystems Management

From
De B. McCallum
Regional Director Science

Security Classification - Classification de sécurité
Non classifié/Unclassified

Our File - Notre référence

Your File - Votre référence

Date

September 17, 2013

Subject
Objet **Review of the Western Newfoundland & Labrador Offshore Area Strategic
Environmental Assessment Update**

The Oceans Division of the Ecosystems Management Branch recently requested a Science review of the "*Western Newfoundland and Labrador Offshore Area Strategic Environmental Assessment (SEA) Update (AMEC May 2013)*." This updated report incorporates comments received during the review of the preliminary draft report that Science provided comments on in January 2013. Upon Science review of the updated SEA document, the following general and more specific comments are provided.

General Comments

Overall, the SEA update is a significant improvement over the first version as the authors have responded well to the reviewers' comments. The document is now updated with recent and relevant research and survey data. In particular, Section 4.2.1.1 on Approach and Key Information Sources is an excellent summary and rationale for the ecosystem approach with references that relate directly to the SEA area. The plankton section is also well done and Science is generally satisfied with the new text and edits used to address previous concerns about marine mammal and sea turtle information descriptions.

The Report mainly covers the natural environment but environmental issues and knowledge gaps are also to be covered in a SEA. Both environmental issues and knowledge gaps are commonly only discussed in a broad manner in a SEA, putatively with the understanding that in the event of oil discovery and potential production at a specific site, a comprehensive Environmental Impact Statement (EIS) must be submitted to the C-NLOPB. (In the case of the Gulf of St Lawrence, an EIS may also be required for exploratory drilling). It is considered important that an EIS focus on potential risks to microbial communities, invertebrates, fish and fisheries in much greater detail than found in SEA reports such as the present one. Perspective on the actual magnitude of risks and

recovery associated with oil spills and potential discharges of produced waters and drilling muds is all important. Understandably, provision of such a perspective requires review and interpretation of a considerable literature base.

There is presently no drilling in the Gulf but seismic surveys are slated for the near future. There is increasing stated caution and concern by agencies and scientists about the unknown effects of high sound pressures on fish and shellfish. For instance, in a review carried out by the Bureau of Ocean Management in the USA, note was especially made with respect to the major knowledge gap for crustaceans as well as fish. It follows that due to this major knowledge gap, it is not possible to provide informed scientific opinion on the degree of any potential risks of seismic surveys. Thus it is very important that this knowledge gap be addressed.

Specific Comments

Section 5.1, (also p. 64, 117). While "Several paragraphs have been added at the end of the 'Previous Spills in the NL Offshore Area' section... additional discussion of this issue has also been added to Chapter 5 (under Fish and Fish Habitat, as it is the first relevant section)", the response to the Science query about under-ice oil spills and fates remains a general response with only vague assurances that if the issue is new or important the C-NLOPB will consider implementing additional spill response technology. While it is understood that this is a SEA and that additional detail might be provided in project-specific Environmental Assessments (EAs), nonetheless the updated SEA does not provide an adequate discussion of the difficulties of under-ice oil detection and recovery which would then provide the background for more detailed project-specific EAs. Despite the Gulf having potentially less sea ice as a result of climate change, the ice that remains is dynamic and unpredictable due to factors such as storm winds. Mention of "on-going C-NLOPB reviews" does not clarify the issues given the lack of timelines and scope for these.

As referred in Science comments S238, S264, S265, Science reiterates that future EAs must take into account the possibility of cumulative effects from multiple concurrent projects, or additive impacts from a sequence of multiple projects. It is premature at the SEA stage to conclude that there will be no cumulative impacts when the authors themselves repeatedly state that more in-depth analyses will be undertaken in subsequent, project-specific EAs.

In response to Science question S257, the AMEC response is: "*At this stage we have been instructed to not provide any such recommendations for new or additional mitigation until the SEA process is further advanced*". Who/ what is the source of this instruction? If by the C-NLOPB, for example, a clear rationale must be provided as to why, at the least, recommendations could not be made for what is supposed to be a broad-scope SEA.

- 3 -

Again, a class-screening document for seismic and other offshore activities does not exist for Newfoundland and Labrador, and an update of the class screening document for Nova Scotia is long overdue.

As referred in Science comment S258, Science is pleased that the revised SEA acknowledges the potential benefits of using trained observers and more clearly-described monitoring methods. Science reiterates the need to collect the number of hours of ON EFFORT duty needed to collect sightings data.

Should you require any additional information on the above review please contact James Meade (james.meade@dfo-mpo.gc.ca), Regional Centre for Science Advice, at 772-3332.



B. McCallum
Regional Director, Science

cc A. Mansour
 R. Anderson
 J. Lawson
 J. Payne
 D. Power
 M. Abbott

jdm